

Alternative South-of-the-Delta Offstream Reservoir Reconnaissance Study

Phase One Memorandum Report

DRAFT

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Introduction

Background

The Department of Water Resources is evaluating alternatives to improve the water supply reliability and operational flexibility of the State Water Project. One often-cited approach for providing these improvements is to increase SWP capabilities for banking water south of the Sacramento-San Joaquin Delta. The concept of water banking is to divert Delta water for storage during periods of high flows and concurrent low-impacts to the Delta ecosystem. This stored water would be released for use during periods of need.

Increasing SWP surface storage capability by constructing an additional offstream reservoir or combination of reservoirs is one way to improve SWP water banking capability. Since the 1960s, the Department has conducted a number of studies to evaluate potential south-of-the-Delta offstream reservoir sites. These studies led to the December 1990 *Los Banos Grandes Facilities Feasibility Report*, which recommended construction of a 1.73 million acre-foot reservoir and associated facilities on Los Banos Creek in western Merced County.

Since 1990, concerns regarding declining Delta conditions has escalated among federal, State, and local interests. Controversy over implementing new Delta water quality standards, improving the Delta ecosystem, and providing a long-term solution to a variety of Delta problems have culminated in the CALFED Bay-Delta Program. While the CALFED process has been successful in bringing stakeholders together to begin formulating a long-term Delta solution, uncertainty remains regarding the ultimate configuration of Delta facilities, water quality standards, and export limitations. Because these factors directly affect the potential benefits associated with the Los Banos Grandes Facilities, the economic feasibility of the project has come into question.

Moreover, the cost of water supplies from LBG, even at levels estimated in the 1990 LBG Feasibility Report, is beyond the level of financial feasibility for some SWP contractors.

The cost of these supplies will most likely be higher when reevaluated under future long-term Delta export constraints. Due to these financial limitations, some contractors would choose not to participate in any potential future offstream storage project for the SWP -- if existing water supply contracts were modified to allow implementation of new SWP conservation facilities for limited groups of contractors. Given this uncertainty in the availability of future Delta exports and the number of contractors who will choose to participate in the project, the Department must reevaluate the feasibility and optimal size of any additional offstream storage reservoir.

If a project is found feasible, the Department must comply with a number of federal, State, and local regulations before proceeding. Before constructing an offstream reservoir, the Department will likely need a permit from the U.S. Army Corps of Engineers, which regulates the discharge of dredge or fill materials into waters of the United States under Clean Water Act Section 404. The Section 404 (b)(1) Guidelines promulgated by the U.S. Environmental Protection Agency govern, in part, the issuance of permits by the Corps. The Corps will not issue a permit unless the project complies with the guidelines. Subpart B of the Section 404 (b)(1) Guidelines states:

No discharge of dredge or fill materials shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences (40 CFR 230.10[a]).

Study Purpose

The purpose of this Alternative South-of-the-Delta Offstream Reservoir Reconnaissance Study is twofold:

1. To evaluate alternative reservoir sites over a wide range of storage volumes for engineering, environmental, economic, and institutional considerations. This

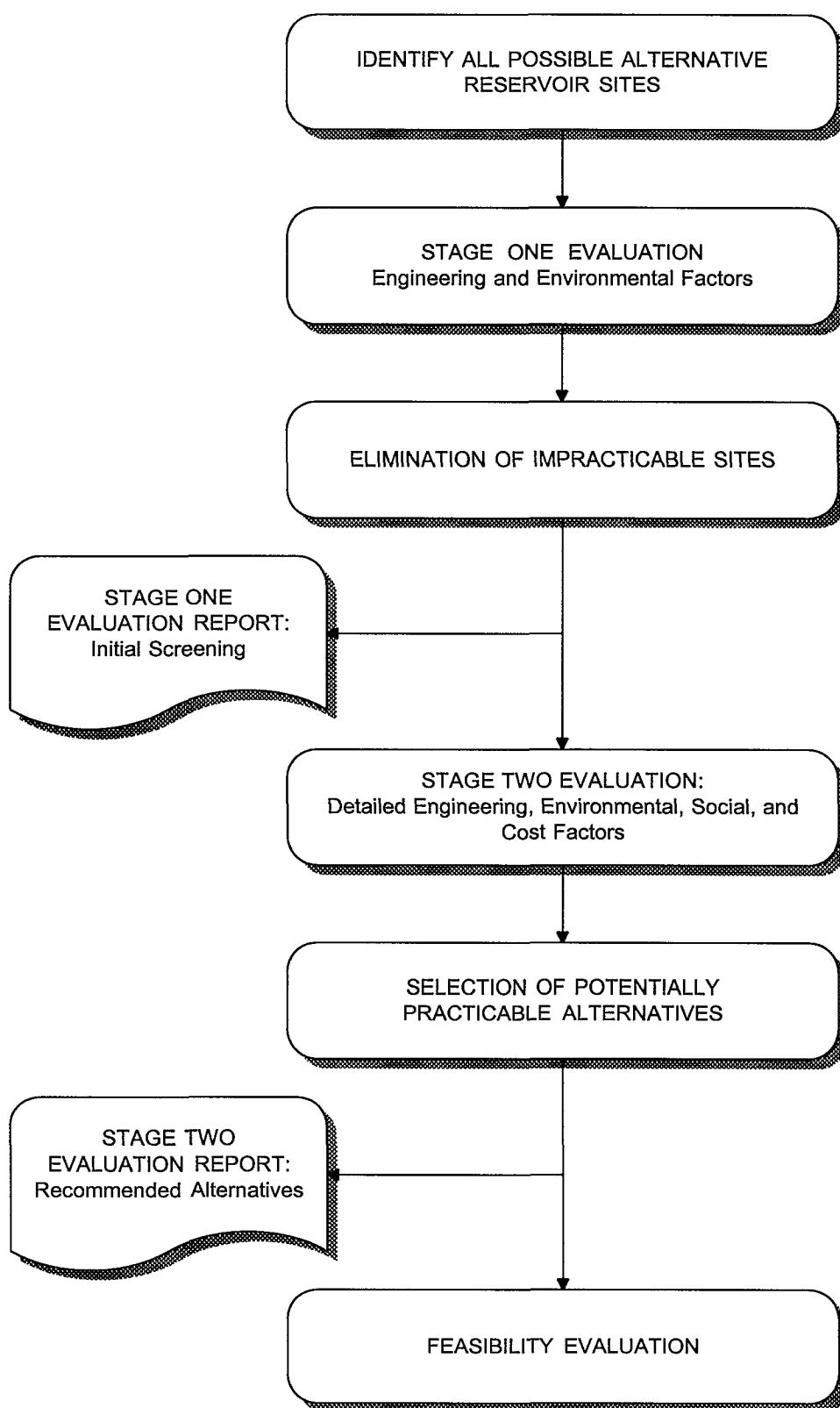
information will be used, once the long-term availability of Delta exports is known, to recommend alternatives for feasibility-level investigation.

2. To provide essential information for an alternative analysis as required by Clean Water Act Section 404 (b)(1) Guidelines. This analysis will identify the least environmentally-damaging, practicable alternative for improving the water supply reliability of the SWP.

This reconnaissance study was originally planned as a two-phase evaluation process to select potential alternative reservoir sites. A schematic of the originally-planned study process is depicted in Figure 1. In Phase One of the evaluation, the Department considered engineering factors and environmental impacts of each potential site at a general level. Those alternatives that were clearly not practicable were eliminated. This report documents the Phase One process.

Originally, Phase Two of the evaluation was envisioned to include more detailed alternative project formulations and more complete engineering and environmental studies for the remaining alternatives. Recommendations were to be made for a feasibility-level study if potentially feasible alternatives were identified. However, as Phase One of this reconnaissance study neared completion, developments in the CALFED Bay-Delta Program affected the Department's plans for additional study.

In September 1996, CALFED completed its first phase of study and identified three alternative long-term solutions to Bay-Delta problems. Among other actions and programs, each alternative includes variable surface storage components for both north and south of the Delta. During the next phase of the CALFED Bay-Delta Program study process, the three alternatives will be refined and evaluated. This evaluation will include an analysis of alternative surface storage reservoirs that could help meet the Bay-Delta Program objectives. To avoid duplication of efforts, the Department's originally-envisioned Phase Two portion of this reconnaissance study was discontinued in favor of CALFED's efforts. The findings summarized in this report will be incorporated into CALFED's study, and serve as a basis for further screening of alternatives for the Bay-Delta Program.

Figure 1. Original Reconnaissance Study Methodology

In addition to factors that are evaluated in this report, final feasibility, optimum size, and location of any future south-of-the-Delta offstream reservoir will depend on 1) the long-term Delta solution and its relationship to south-of-the-Delta offstream storage, 2) conclusions of the subsequent feasibility investigation, 3) determination of future levels of financial feasibility of the SWP contractors, and 4) development of an equitable cost-sharing agreement.

It should be noted that increasing south-of-the-Delta offstream reservoir capacity is only one alternative for increasing SWP water supply reliability. Other alternatives, such as conjunctive use projects, increasing upstream-of-the-Delta reservoir capacity, or various local projects of SWP contractors, are also currently under evaluation. This study is intended to provide an evaluation of alternative south-of-the-Delta offstream reservoir sites that can later be incorporated into an overall assessment of SWP reliability needs and an analysis of the projects best suited to meet those needs.

Summary of Previous Reports

Several studies have been conducted in the past thirty years by the Department and the U. S. Bureau of Reclamation to evaluate alternative south-of-the-Delta reservoirs. However, a complete analysis of all potential sites, adequate to satisfy current environmental regulations, has not been completed. In most past efforts, emphasis was given to technical engineering factors; environmental concerns were evaluated in only two previous reports. Final recommendations were based primarily on costs in all previous reports.

A description of previous reports published by the Department concerning alternative offstream storage projects is presented in Appendix A.

Overview of the Screening Process

Alternative reservoir sites are screened in this study by comparing their potential to economically improve SWP water supply reliability while resulting in minimal environmental

and social impacts. Quantitative processes are used to evaluate alternatives in this study to provide a clear record to backup the screening results.

Overview of the Phase One Evaluation

During Phase One of the evaluation, an exhaustive list of alternative offstream reservoir sites that could meet the basic project purpose was prepared. Table 1 lists the watersheds with potential reservoir sites considered in this study, and Figures 2a and 2b show the general location of the proposed reservoir sites.

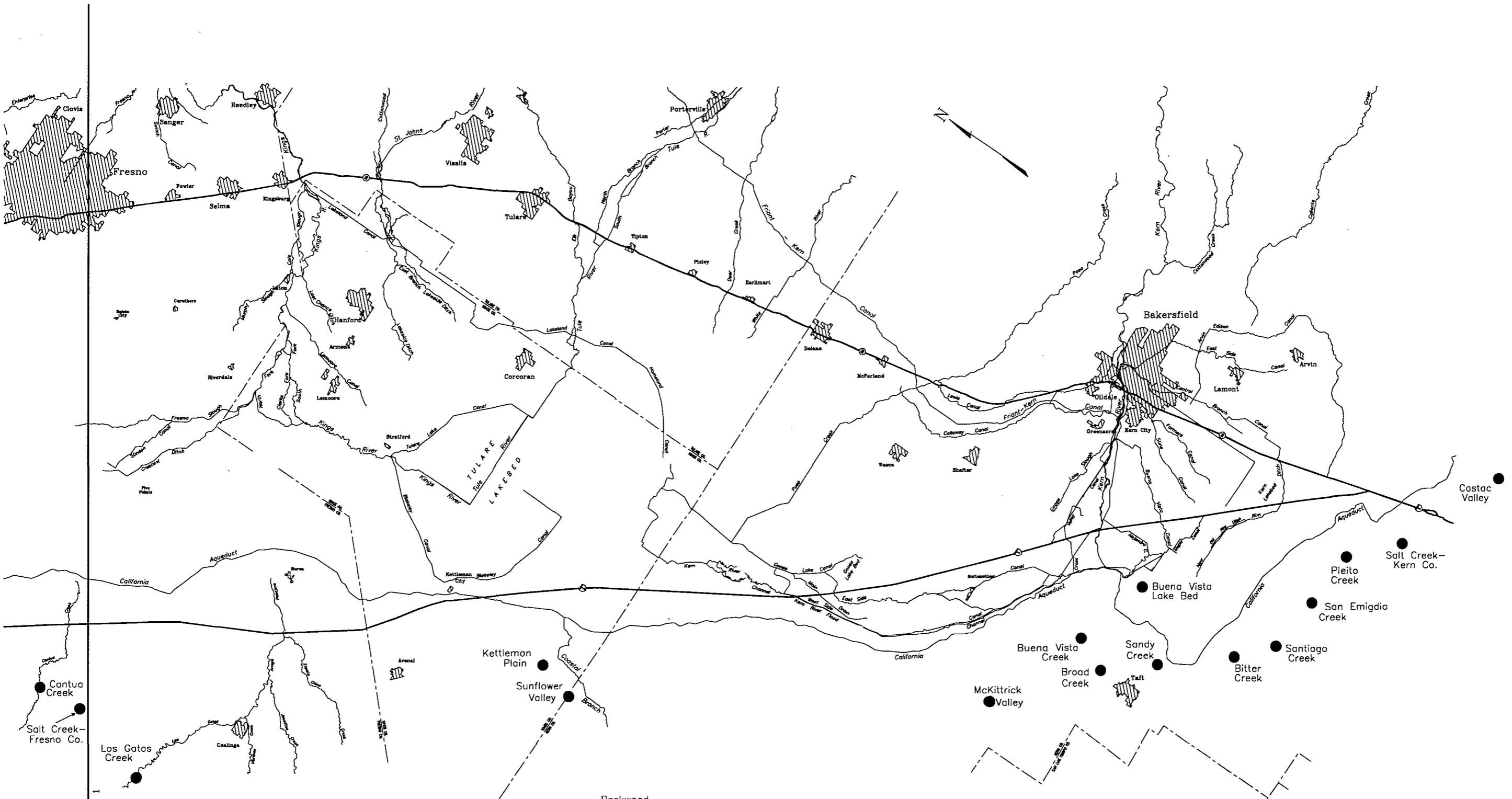
Table 1. Watersheds with Potential Reservoir Sites Considered in Phase One

Arroyo Ciervo	Del Puerto Canyon	McKittrick Valley	Salado Creek
Arroyo Hondo	Garzas Creek	Moreno Gulch	Salt Creek-Fresno Co.
Bitter Creek	Hospital Creek	Mustang Creek	Salt Creek-Kern Co.
Bitterwater Valley	Ingram Canyon	Orestimba Creek	Salt Creek-Merced Co.
Broad Creek	Kern Canyon	Ortigalita Creek	San Emigdio Creek
Buena Vista Creek	Kettleman Plain	Oso Creek	San Luis Creek
Buena Vista Lake Bed	Laguna Seca Creek	Packwood Creek	Sandy Creek
Cantua Creek	Little Panoche Creek	Panoche Hills	Santiago Creek
Capita Canyon	Little Salado Creek	Panoche Creek	Silver Creek
Castac Valley	Lone Tree Creek	Pleito Creek	Sunflower Valley
Crow Creek	Los Banos Creek	Quinto Creek	Wildcat Canyon
Deep Gulch	Los Gatos Creek	Romero Creek	

The engineering, environmental, and economic characteristics of each alternative were evaluated at an appraisal level. Alternatives that could not be considered practicable due to obvious engineering, environmental, and economic reasons were eliminated. A summary of the Phase One evaluation activities is presented below.

Preliminary Work

- Develop the range of reservoir sizes and conveyance facilities capacities to be evaluated.



Match Line for Page 1

FIGURE 2b

Alternative South-of-the-Delta Offstream Reservoir Sites

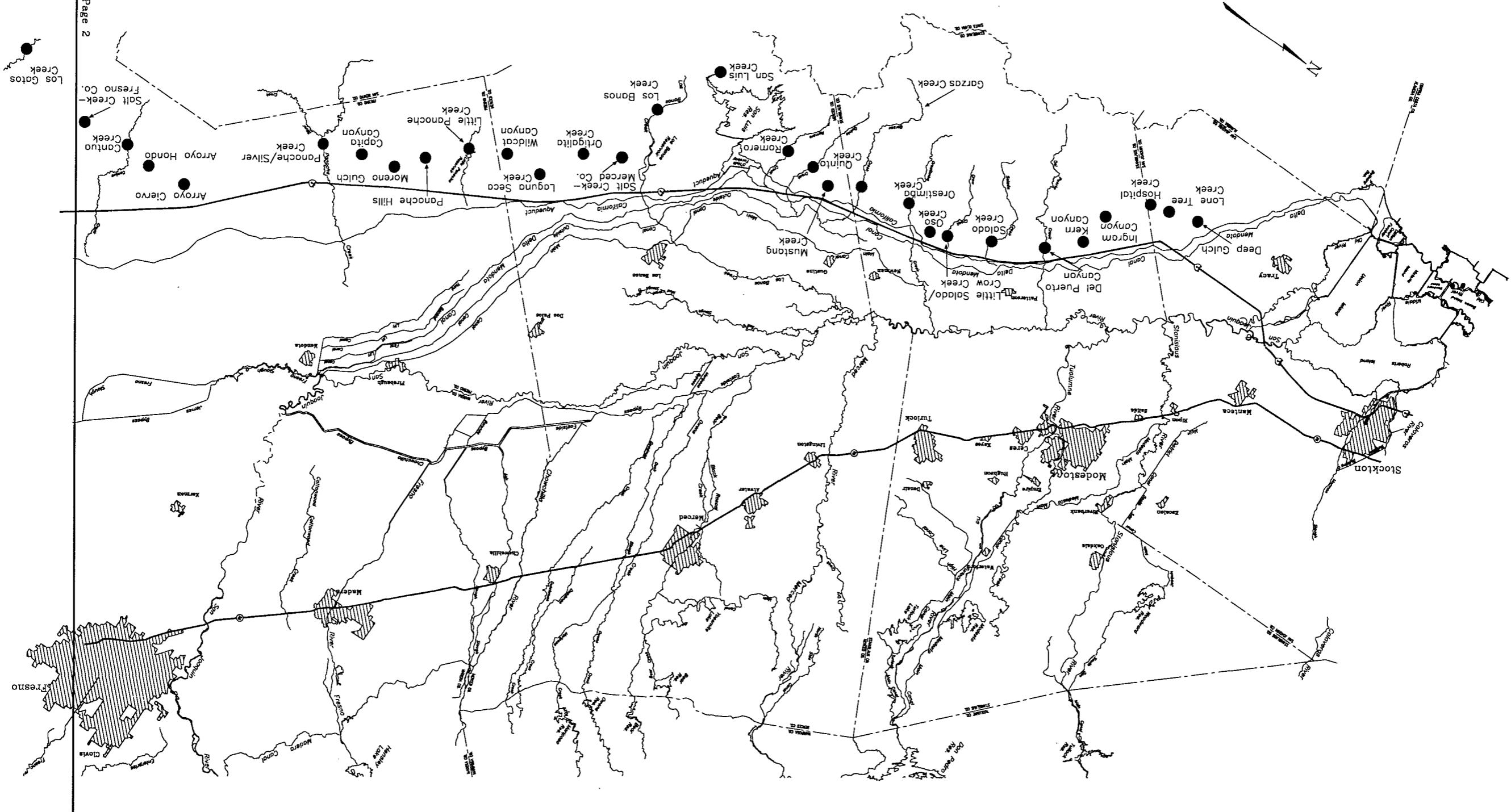
● Phase One Potential Reservoir Sites

Scale of Miles
2 0 2 4 6 8

D - 0 0 3 8 4 7

Alternative South-of-the-Delta Offstream Reservoir Sites
● Phase One Potential Reservoir Sites

FIGURE 2A



- Identify all potential reservoir sites.

Engineering Studies and Economic Studies

- Collect and review engineering information from appropriate reports prepared by DWR and USBR since the 1950s, concentrating on areas west of the California Aqueduct.
- Develop engineering information for all potential sites.
- Develop appraisal-level design and cost estimates for dams and associated facilities for a variety of storage volumes at each potential site.
- Determine scores for each site covering the range of potential storage volumes at each site, based on the capital cost per acre-foot of storage.

Environmental Studies

- Review available literature, maps, and aerial photos for each site.
- Summarize information for each site, including data on wetlands, vegetation, wildlife, and other environmental factors.
- Determine a score for each site based on the overall environmental sensitivity.

Screening of Alternatives

- Determine total combined economic and environmental scores for each site covering the range of potential storage volumes at each site.
- Select alternatives for subsequent investigation based on total combined scores for each reservoir size category.
- Ensure that the selected alternatives include the sites with the highest economic scores and/or the highest environmental scores.

Overview of the Phase Two Evaluation

As originally planned, the Department's Phase Two evaluation would have included more detailed analyses to further screen alternatives and determine if a feasibility-level study is justified. As noted earlier, these planned efforts were discontinued to avoid duplication

with similar studies proceeding under the CALFED Bay-Delta Program. The Department's study plan for Phase Two is summarized here to draw a distinction between the level of detail developed for Phase One screening and the level of detail envisioned for Phase Two screening.

For Phase Two, field reconnaissance of each site was planned to collect data for analysis. In addition to more detailed project formulation and design of facilities, the Phase Two evaluation would have included operation and maintenance considerations. Proposed conceptual mitigation plans and their costs will be prepared for all alternatives.

A summary of the activities planned for the Phase Two evaluation follows:

Engineering and Economic Studies

- Develop potential project operation criteria and perform operation studies based on needs of participating contractors and most current information regarding Delta regulations and future Delta facilities.
- Develop reconnaissance-level geologic information for selected sites and configurations.
- Develop reconnaissance-level design of facilities and corresponding cost estimates for selected sites and configurations.
- Develop reconnaissance-level information and cost estimates for right of way property, as well as relocation of roads and other existing structures for selected sites and configurations.
- Develop cost estimates for preliminary mitigation plans.
- Develop total estimated operational project costs for alternatives.
- Determine final rankings based on engineering feasibility and economics.

Environmental Studies

- Develop more detailed environmental information for each alternative through field observation.
- Develop conceptual mitigation plans for each alternative.
- Determine final rankings based on environmental sensitivity.

Final Screening

- Combine final rankings and determine the alternatives that best meet project objectives.
- Develop recommendations for feasibility study.

Phase One Evaluation

Overview of Phase One

In the Phase One evaluation process, an appraisal-level analysis was conducted to screen out reservoir alternatives that are clearly impracticable. During Phase One, all reasonable offstream reservoir sites on the west side of the San Joaquin Valley were identified. Alternatives on the east side of the valley were not considered in this study due to the excessive cost of transporting water the necessary distance from the California Aqueduct. It is acknowledged, however, that there may be opportunities to develop eastside alternatives that avoid the need for conveyance facilities from the California Aqueduct by implementing a series of water exchanges. The investigation of such alternatives was considered to be beyond the scope of this study.

A total of 96 damsites in 48 watersheds were identified on the west side of the San Joaquin Valley (see Figures 2a and 2b). For each potential reservoir, the capital cost and the potential environmental impacts were evaluated and rated to determine the sites that should be studied in more detail during subsequent investigation.

A wide range of storage volumes was analyzed to envelope the sizes of potentially feasible projects that might result depending on: (1) the future long-term availability of exports from the Delta, and (2) the level of SWP contractor participation in the project. All reasonable reservoir sizes were considered for each alternative damsite. Volumes from 100,000 acre-feet to 2,000,000 acre-feet of storage were classified into four categories to simplify the evaluation process (see Table 2).

For Phase One, the inlet/outlet capacity for all alternatives was set at 3,500 cfs. Based on preliminary operation studies, this capacity provides a near-maximum benefit/cost ratio for a wide range of reservoir volumes. (Reservoirs smaller than 500,000 acre-feet would probably best be served by a smaller inlet/outlet capacity; for simplicity, only one value was evaluated in Phase One.) Alternative inlet/outlet capacities will be evaluated more extensively during subsequent investigation.

Table 2. Reservoir Size Categories

Category	Storage Volume (acre-feet)
Small	100,000 - 250,000
Medium	250,000 - 500,000
Large	500,000 - 1,000,000
Very Large	1,000,000 - 2,000,000

Engineering and environmental information for each alternative was developed and rated separately. The two ratings were combined to formulate an overall rating for each alternative. These combined total ratings were used to select the reservoir sites to be studied in further detail during subsequent investigation.

Development of Engineering Information

To evaluate and compare engineering characteristics, site information was gathered and construction costs were estimated for each alternative. For this purpose, a basic design configuration was selected and geological conditions were assumed uniform for all reservoirs. The potential for forebays was not evaluated at this level of study; forebay-reservoir configurations will be developed and analyzed in subsequent investigation. The conditions and assumptions made for all reservoirs in Phase One were:

- The main damsite is located where convenient for a conveyance facility from the California Aqueduct.
- All necessary saddle dams are identified.
- The main dams are located in the narrowest portion of each canyon.
- All dam crest widths are set at 40 feet.
- All dam downstream slopes are set at 3:1.
- All dam upstream slopes are set at 3.5:1.
- Freeboard depth is calculated as 5 percent of dam height with a minimum of 4 feet and a maximum of 30 feet.

- Pumping/generating facility capacities are set at 3,500 cfs.

The process to develop each reservoir's configuration was the same for all alternatives. The steps used are as follows:

1. Locate the best topographic location for damsites and delineate the corresponding water surface elevation levels using USGS topographical 7.5 minute quad maps (scale 1" = 2000').
2. Name each reservoir alternative using the drainage, creek, or canyon name where the main damsite is located. Each reservoir alternative of that drainage will be given a number in addition to the name. For example, Pleito Creek 3 is the third reservoir alternative within the Pleito Creek watershed.
3. Assign each dam axis a dam number. Each dam number may be included in more than one reservoir alternative due to alternate crest elevations of that dam axis.
4. Name the saddle dams, if any, according to the alternative to which they belong. For example: "Romero Creek 2 - Saddle Dam 58."
5. Calculate the storage capacity (in thousands of acre-feet) and water surface area (in acres) of each reservoir at maximum water surface elevation.
6. Calculate the embankment volume of each main dam and saddle dam (in cubic yards).
7. Record other pertinent data for each alternative:
 - County name of reservoir location
 - Streambed elevation at main damsite in feet
 - Minimum water surface elevation at California Aqueduct in feet
 - Distance from the California Aqueduct in miles
 - Distance from the Delta Pumping Plant in miles

Table 3 summarizes pertinent engineering data for each alternative. A more detailed table of engineering information is presented in Appendix B.

Determination of Project Costs

The capital costs of all reservoir alternatives were estimated based on previous cost estimates for the LBG facilities, updated to 1995 prices. Total capital cost was broken into 16 categories, as described below. Straight-line projection was used for estimating most of the cost items -- more complex procedures were used to estimate costs for pumping/generating plants and mitigation, as described later in this section. A summary of itemized capital costs of each reservoir alternative are presented in Table 4. A complete itemization of costs is included in Appendix C. A description of the process used to determine each cost item is presented below.

Dam Embankment

The dam embankment cost estimates were based on the unit price of fill for the LBG embankment, estimated at \$9.02 per cubic yard. The cost of embankment for each alternative was estimated by multiplying the total embankment volume by this unit cost.

Spillway

The spillway cost estimates were based on the height of the dam. The total cost of the LBG 414-foot high main dam spillway was estimated at \$20,900,000. This estimate yields a unit cost of \$50,500 per foot of dam. The cost of the spillway for each alternative was estimated by multiplying the unit cost by the height of the dam.

Project Lands

The required project lands include a buffer area around the maximum water surface area for each alternative reservoir. Project lands do not include areas purchased for mitigation. For LBG, the project area was estimated at 17,000 acres, and the reservoir area at 12,870 acres. The ratio of total acres versus inundated area is 1.32. The total required lands for other alternatives were calculated using this ratio and their corresponding maximum water surface area. The estimated unit price per acre for LBG is \$1,300 (\$22,400,000

Table 3. Engineering Data

Alternative Offstream Reservoir	Main Dam Number	Dam Crest Elevation (feet)	Total Embankment Volume (million yds ³)	Normal Operating Pool Storage Capacity (TAF)	Maximum Water Surface Area (acres)	Maximum Pumplift (feet)
Arroyo Ciervo 1	4	2,000	150.0	278	1,299	1,646
Arroyo Ciervo 2	4	1,800	62.6	105	655	1,451
Arroyo Hondo 1	7	2,000	334.3	896	3,754	1,651
Arroyo Hondo 2	7	1,920	252.2	641	3,101	1,571
Arroyo Hondo 3	14	1,600	157.1	674	3,394	1,251
Arroyo Hondo 4	14	1,520	111.2	456	2,711	1,172
Arroyo Hondo 5	7	1,800	161.3	356	2,135	1,451
Arroyo Hondo 6	7	1,600	52.9	100	883	1,260
Arroyo Hondo 7	14	1,400	61.8	232	1,694	1,058
Arroyo Hondo 8	11	1,000	10.0	75	887	670
Bitter Creek 1	16	1,750	39.9	192	1,440	1,232
Bitter Creek 2	17	3,000	295.8	462	1,517	2,473
Bitter Creek 3	123	2,250	56.5	101	595	1,723
Bitterwater Valley 1	18	1,700	38.1	396	3,633	1,379
Bitterwater Valley 2	128	1,600	17.7	145	1,744	1,284
Bitterwater Valley 3	128	1,500	6.3	40	690	1,188
Broad Creek	98	800	4.1	31	756	499
Buena Vista Creek	97	800	11.7	59	1,138	499
Buena Vista Lake Bed	-	290	0.0	91	17,983	10
Cantua Creek 1	116	1,600	773.2	1,327	5,752	1,251
Cantua Creek 2	20	1,400	107.1	614	3,903	1,056
Cantua Creek 3	22	1,200	36.8	249	2,110	862
Cantua Creek 4	21	800	16.8	82	1,077	470
Cantua Creek 5	116	1,400	359.6	513	3,347	1,058
Cantua Creek 6	116	1,200	112.3	117	1,221	868
Cantua Creek 7	20	1,200	19.3	150	1,487	866
Capita Canyon	42	1,400	19.0	27	165	1,053
Castac Valley 1	47	4,000	230.9	826	2,755	2,736
Castac Valley 2	117	3,250	792.1	1,206	3,097	1,982
Castac Valley 3	117	3,000	442.1	641	1,745	1,732
Castac Valley 4	117	2,750	221.6	317	1,019	1,482
Castac Valley 5	117	2,500	97.6	135	551	1,232
Deep Gulch	28	800	7.2	58	634	555
Del Puerto Canyon 1	191	460	6.2	88	897	217
Del Puerto Canyon 2	193	600	13.4	94	969	353
Del Puerto Canyon 3	194	720	36.7	191	1,656	468
Del Puerto Canyon 4	193	500	6.0	35	430	258
Del Puerto Canyon 5	194	600	16.6	71	757	354

Table 3, Page 1

Table 3. Engineering Data

Alternative Offstream Reservoir	Main Dam Number	Dam Crest Elevation (feet)	Total Embankment Volume (million yds ³)	Normal Operating Pool Storage Capacity (TAF)	Maximum Water Surface Area (acres)	Maximum Pumplift (feet)
Garzas Creek 1	104	1,200	155.5	1,754	8,181	920
Garzas Creek 2	105	1,000	52.4	628	4,225	723
Garzas Creek 3	106	700	23.3	312	2,715	430
Garzas Creek 4	107	600	23.5	262	2,232	334
Garzas Creek 5	108	800	79.9	574	4,509	525
Garzas Creek 6	109	1,000	108.4	939	5,777	720
Garzas Creek 7	108	720	54.0	346	2,631	449
Garzas Creek 8	108	600	19.0	138	1,411	335
Garzas Creek 9	109	920	78.1	599	4,204	643
Garzas Creek 10	109	800	36.0	277	2,266	529
Garzas Creek 11	109	720	21.8	163	1,251	453
Garzas Creek 12	105	920	35.9	380	3,065	647
Garzas Creek 13	105	880	26.3	289	2,759	609
Garzas Creek 14	106	600	9.4	139	1,416	335
Garzas Creek 15	106	640	14.6	194	2,002	373
Garzas Creek 16	107	400	1.8	24	473	144
Garzas Creek 17	107	480	7.3	75	973	220
Garzas Creek 18	104	1,120	108.1	1,202	6,705	840
Garzas Creek 19	104	1,000	67.2	628	4,293	723
Garzas Creek 20	104	920	40.9	379	3,053	647
Garzas Creek 21	104	800	14.0	149	1,531	533
Garzas Creek 22	104	720	6.8	72	782	457
Garzas Creek 23	104	740	8.3	86	969	476
Garzas Creek 24	106	540	5.2	79	1,212	278
Garzas Creek 25	108	540	11.3	79	1,194	278
Hospital Creek 1	35	1,000	73.3	385	2,122	743
Hospital Creek 2	124	1,520	99.7	552	2,674	1,260
Hospital Creek 3	126	1,800	321.2	1,155	4,205	1,540
Hospital Creek 4	127	1,200	166.5	820	3,544	940
Hospital Creek 5	36	600	4.7	18	283	362
Hospital Creek 6	36	800	30.1	152	1,302	552
Ingram Canyon 1	37	1,200	83.0	977	4,524	940
Ingram Canyon 2	37	1,000	32.1	333	2,599	744
Ingram Canyon 3	37	800	7.2	67	633	554
Ingram/Kern Canyon	37	1,200	216.9	1,201	5,784	940
Kern Canyon	40	1,200	134.4	223	1,260	940
Kettleman Plain 1	99	500	4.9	283	9,146	184
Kettleman Plain 2	99	475	2.9	133	5,542	161
Kettleman Plain 3	99	490	4.0	220	7,695	175
Kettleman Plain 4	99	465	2.3	89	4,178	151

Table 3, Page 2

Table 3. Engineering Data

Alternative Offstream Reservoir	Main Dam Number	Dam Crest Elevation (feet)	Total Embankment Volume (million yds ³)	Normal Operating Pool Storage Capacity (TAF)	Maximum Water Surface Area (acres)	Maximum Pumplift (feet)
Laguna Seca Creek 1	70	1,000	34.6	228	3,324	650
Laguna Seca Creek 2	131	900	12.5	85	1,209	552
Laguna Seca Creek 3	73	800	13.1	53	591	453
Laguna Seca Creek 4	72	600	3.5	24	355	259
Little Panoche Creek 1	76	900	26.8	279	3,214	557
Little Panoche Creek 2	146	800	8.3	107	1,747	461
Little Salado/Crow Creek 1	63	400	11.5	132	2,910	164
Little Salado/Crow Creek 2	67	800	52.1	250	2,084	551
Little Salado/Crow Creek 3	63	360	3.0	49	1,760	126
Little Salado/Crow Creek 4	63	340	1.5	22	1,150	106
Lone Tree Creek 1	30	880	8.2	53	620	637
Lone Tree Creek 2	139	1,400	122.8	432	2,156	1,140
Lone Tree Creek 3	139	1,200	51.2	155	1,023	947
Lone Tree Creek 4	33	800	10.3	63	639	557
Lone Tree Creek 5	32	600	5.1	19	294	361
Los Banos Creek 1	181	800	29.2	2,000	14,710	556
Los Banos Creek 2	181	720	13.7	1,117	11,442	480
Los Banos Creek 3	181	640	4.9	477	7,194	404
Los Banos Creek 4	181	600	2.6	276	4,932	366
Los Banos Creek 5	181	520	1.0	67	1,485	290
Los Gatos Creek 1	26	1,800	344.8	2,500	10,679	1,457
Los Gatos Creek 2	100	1,560	260.6	1,167	6,480	1,218
Los Gatos Creek 3	102	1,400	22.5	170	1,528	1,070
Los Gatos Creek 4	103	1,400	57.4	295	2,419	1,068
Los Gatos Creek 5	27	1,000	2.4	24	602	681
McKittrick Valley	93	1,000	7.0	89	2,010	691
Moreno Gulch 1	43	1,800	177.1	598	2,847	1,443
Moreno Gulch 2	121	1,600	52.8	265	1,746	1,244
Moreno Gulch 3	121	1,400	15.3	68	607	1,054
Moreno Gulch 4	44	1,200	15.0	36	345	858
Mustang Creek	50	700	19.3	60	490	468
Orestimba Creek 1	171	800	133.4	1,137	5,681	544
Orestimba Creek 2	171	600	43.5	378	2,914	354
Orestimba Creek 3	170	1,000	69.5	900	5,694	740
Orestimba Creek 4	170	800	23.6	295	1,703	549
Orestimba Creek 5	170	600	3.6	75	775	359
Orestimba Creek 6	171	400	3.2	48	804	164
Ortigalita Creek	176	800	8.6	100	2,049	574
Oso Creek 1	138	800	34.0	116	983	551
Oso Creek 2	160	800	22.5	83	785	553

Table 3, Page 3

Table 3. Engineering Data

Alternative Offstream Reservoir	Main Dam Number	Dam Crest Elevation (feet)	Total Embankment Volume (million yds ³)	Normal Operating Pool Storage Capacity (TAF)	Maximum Water Surface Area (acres)	Maximum Pumplift (feet)
Packwood Creek 1	79	1,200	28.0	277	3,046	882
Packwood Creek 2	130	1,100	5.5	92	1,483	788
Panoche Hills	132	1,100	13.6	85	1,059	758
Panoche/Silver Creek 1	45	1,200	124.5	989	5,450	843
Panoche/Silver Creek 2	111	800	15.8	242	2,627	461
Panoche/Silver Creek 3	112	1,000	84.0	1,068	6,293	649
Panoche/Silver Creek 4	113	1,200	94.0	672	6,773	845
Panoche/Silver Creek 5	114	1,200	215.9	2,647	15,085	842
Panoche/Silver Creek 6	111	720	5.6	91	1,583	385
Panoche/Silver Creek 7	111	760	9.9	158	2,135	423
Panoche/Silver Creek 8	112	800	21.3	265	2,817	459
Panoche/Silver Creek 9	112	880	41.0	514	4,307	535
Panoche/Silver Creek 10	45	1,120	75.4	667	4,034	767
Panoche/Silver Creek 11	45	1,000	34.3	328	2,501	653
Panoche/Silver Creek 12	45	800	5.3	46	724	463
Panoche/Silver Creek 13	113	1,120	64.1	375	3,304	769
Panoche/Silver Creek 14	113	1,000	26.0	158	1,240	655
Panoche/Silver Creek 15	114	1,120	154.9	1,825	10,017	765
Panoche/Silver Creek 16	114	1,000	85.8	1,006	6,028	651
Panoche/Silver Creek 17	114	800	17.2	244	2,574	461
Panoche/Silver Creek 18	114	720	6.0	92	1,557	385
Panoche/Silver Creek 19	112	700	8.1	77	1,566	364
Pleito Creek 1	86	3,000	816.6	783	1,977	2,478
Pleito Creek 2	118	3,750	900.5	2,447	5,392	3,228
Pleito Creek 3	118	3,500	601.0	1,357	3,730	2,978
Pleito Creek 4	118	3,250	331.4	662	2,198	2,728
Pleito Creek 5	118	3,000	149.9	284	1,087	2,478
Pleito Creek 6	118	2,750	56.5	104	501	2,228
Quinto Creek 1	54	600	34.3	332	3,239	370
Quinto Creek 2	101	800	47.4	381	2,509	563
Quinto Creek 3	54	500	13.3	113	1,738	275
Romero Creek 1	56	600	21.4	184	1,589	370
Romero Creek 2	56	520	9.5	88	1,054	294
Salado Creek 1	62	900	21.5	78	777	651
Salado Creek 2	135	900	29.4	147	1,191	649
Salado Creek 3	137	1,200	40.4	382	3,086	944
Salado Creek 4	137	1,000	9.3	58	825	754
Salt Creek 1-Fresno Co.	24	1,400	70.2	380	2,519	1,054
Salt Creek 2-Fresno Co.	24	1,360	56.3	328	2,105	1,016
Salt Creek 3-Fresno Co.	24	1,200	21.6	117	980	864

Table 3, Page 4

Table 3. Engineering Data

Alternative Offstream Reservoir	Main Dam Number	Dam Crest Elevation (feet)	Total Embankment Volume (million yds ³)	Normal Operating Pool Storage Capacity (TAF)	Maximum Water Surface Area (acres)	Maximum Pumplift (feet)
Salt Creek 1-Kern Co.	91	3,500	135.2	283	1,221	2,229
Salt Creek 2-Kern Co.	134	2,750	117.6	323	1,309	1,479
Salt Creek 3-Kern Co.	134	2,500	32.9	105	613	1,231
Salt Creek 1-Merced Co.	1	500	0.9	61	1,576	279
Salt Creek 2-Merced Co.	148	520	2.8	72	1,950	299
San Emigdio Creek 1	77	2,500	63.3	101	901	1,984
San Emigdio Creek 2	120	4,250	338.6	757	1,908	3,725
San Luis Creek 1	143	1,200	170.3	1,196	4,898	930
San Luis Creek 2	143	1,120	131.8	862	4,063	850
San Luis Creek 3	143	1,000	72.8	501	2,757	733
San Luis Creek 4	143	720	10.9	70	780	467
San Luis Creek 5	145	720	36.5	282	2,114	463
San Luis Creek 6	145	600	10.4	106	1,198	349
Sandy Creek	92	750	14.2	50	990	242
Santiago Creek 1	19	3,000	252.3	459	1,815	2,473
Santiago Creek 2	19	2,750	84.6	147	960	2,232
Sunflower Valley 1	177	700	9.3	535	10,777	386
Sunflower Valley 2	177	675	5.8	322	8,198	361
Sunflower Valley 3	177	650	3.3	168	5,617	337
Sunflower Valley 4	177	625	1.5	66	3,261	312
Wildcat Canyon	74	1,000	15.6	79	1,185	654

Table 4. Cost Estimates in Millions of Dollars

Alternative Offstream Reservoir	Main Dam Number	Dam and Related Structures	Plant and Conveyance Facilities	Project Lands	Mitigation	Bond Financing	Other	Total Capital Cost
Arroyo Cielvo 1	4	1,423.1	489.3	2.2	10.6	116.4	25.7	2,067
Arroyo Cielvo 2	4	608.5	465.5	1.2	5.4	65.2	10.7	1,157
Arroyo Hondo 1	7	3,133.6	651.6	6.5	32.0	232.3	80.7	4,137
Arroyo Hondo 2	7	2,370.9	642.1	5.3	26.5	184.9	60.0	3,290
Arroyo Hondo 3	14	1,508.9	541.5	5.9	29.0	127.4	63.9	2,277
Arroyo Hondo 4	14	1,075.2	530.8	4.7	23.1	99.7	45.5	1,779
Arroyo Hondo 5	7	1,523.8	627.4	3.6	18.2	131.7	35.6	2,340
Arroyo Hondo 6	7	514.7	602.4	1.6	7.4	68.0	11.6	1,206
Arroyo Hondo 7	14	606.2	514.7	2.9	14.2	69.2	24.9	1,232
Arroyo Hondo 8	11	110.9	429.2	1.6	7.4	33.3	9.9	592
Bitter Creek 1	16	403.2	432.2	2.5	10.9	51.7	20.7	921
Bitter Creek 2	17	2,774.1	642.0	2.6	11.5	207.2	39.4	3,677
Bitter Creek 3	123	562.4	529.7	1.0	4.5	66.2	10.0	1,174
Bitterwater Valley 1	18	395.4	766.5	6.2	31.0	73.7	46.6	1,319
Bitterwater Valley 2	128	187.9	756.5	3.0	14.6	58.5	19.3	1,040
Bitterwater Valley 3	128	70.7	743.5	1.2	5.8	49.5	6.6	877
Broad Creek	98	49.3	275.8	1.3	5.5	20.2	6.2	358
Buena Vista Creek	97	119.5	309.0	2.0	8.2	26.7	10.3	476
Buena Vista Lake Bed	-	7.3	19.4	30.8	134.8	16.5	105.1	314
Cantua Creek 1	116	7,107.5	492.8	9.9	47.1	463.7	120.5	8,242
Cantua Creek 2	20	1,041.9	452.1	6.8	31.3	94.2	62.5	1,689
Cantua Creek 3	22	375.8	405.5	3.6	16.9	49.2	28.3	879
Cantua Creek 4	21	172.7	285.6	1.8	8.4	28.6	11.4	509
Cantua Creek 5	116	3,310.2	466.0	5.7	26.8	230.5	52.8	4,092
Cantua Creek 6	116	1,039.3	437.7	2.1	9.6	89.9	14.5	1,593
Cantua Creek 7	20	205.6	423.8	2.6	11.7	39.3	18.2	701
Capita Canyon	42	201.3	380.7	0.3	1.3	35.1	2.7	621
Castac Valley 1	47	2,173.8	597.4	4.7	26.6	170.6	70.4	3,044
Castac Valley 2	117	7,335.9	423.8	5.3	29.9	471.0	97.9	8,364
Castac Valley 3	117	4,124.1	395.2	3.0	16.5	274.1	52.5	4,865
Castac Valley 4	117	2,095.7	364.9	1.7	9.7	149.3	26.8	2,648
Castac Valley 5	117	946.8	332.4	0.9	5.2	77.5	12.0	1,375
Deep Gulch	28	90.6	268.9	1.0	4.6	22.2	7.4	395
Del Puerto Canyon 1	191	81.3	110.3	1.6	6.8	12.4	10.8	223
Del Puerto Canyon 2	193	152.7	177.1	1.7	7.3	20.8	11.6	371
Del Puerto Canyon 3	194	376.6	205.8	2.9	12.6	36.7	21.9	657
Del Puerto Canyon 4	193	74.5	153.9	0.8	3.3	14.1	4.7	251
Del Puerto Canyon 5	194	178.6	181.6	1.3	5.7	22.4	8.9	399

Table 4, Page 1

Table 4. Cost Estimates in Millions of Dollars

Alternative Offstream Reservoir	Main Dam Number	Dam and Related Structures	Plant and Conveyance Facilities	Project Lands	Mitigation	Bond Financing	Other	Total Capital Cost
Garzas Creek 1	104	1,568.9	361.1	14.0	62.7	126.2	162.5	2,295
Garzas Creek 2	105	552.7	329.8	7.3	31.7	57.7	65.3	1,045
Garzas Creek 3	106	259.6	215.5	4.7	20.4	31.4	35.8	567
Garzas Creek 4	107	252.9	172.2	3.8	16.7	27.9	29.9	503
Garzas Creek 5	108	794.1	234.7	7.8	33.8	66.6	63.4	1,200
Garzas Creek 6	109	1,083.4	300.4	9.9	44.3	89.8	94.7	1,623
Garzas Creek 7	108	540.2	219.9	4.6	19.7	48.5	37.7	871
Garzas Creek 8	108	202.1	195.2	2.5	10.3	25.3	17.0	452
Garzas Creek 9	109	782.7	287.4	7.2	31.5	68.9	63.3	1,241
Garzas Creek 10	109	373.4	266.5	3.9	17.0	40.8	31.1	733
Garzas Creek 11	109	232.0	251.7	2.2	9.2	30.4	17.8	543
Garzas Creek 12	105	382.0	316.9	5.2	23.0	45.2	42.4	815
Garzas Creek 13	105	286.6	309.9	4.7	20.7	38.6	34.4	695
Garzas Creek 14	106	115.5	195.2	2.5	10.4	20.1	17.1	361
Garzas Creek 15	106	169.0	203.2	3.4	15.0	24.4	24.0	439
Garzas Creek 16	107	26.9	121.2	0.8	3.5	9.3	4.2	166
Garzas Creek 17	107	85.7	143.5	1.7	7.1	14.7	10.4	263
Garzas Creek 18	104	1,100.4	349.0	11.6	51.4	95.0	117.5	1,725
Garzas Creek 19	104	686.2	329.8	7.4	32.2	65.8	65.7	1,187
Garzas Creek 20	104	427.0	316.9	5.2	22.9	47.9	42.2	862
Garzas Creek 21	104	160.8	296.0	2.6	11.2	29.0	18.4	518
Garzas Creek 22	104	84.8	281.3	1.3	5.7	22.7	9.1	405
Garzas Creek 23	104	100.9	284.8	1.7	7.1	24.1	11.1	430
Garzas Creek 24	106	69.3	181.6	2.1	8.9	16.2	12.0	290
Garzas Creek 25	108	124.3	181.6	2.1	8.7	19.5	11.8	348
Hospital Creek 1	35	725.9	280.1	3.6	16.3	62.9	37.4	1,126
Hospital Creek 2	124	989.7	453.8	4.6	20.5	90.0	51.6	1,610
Hospital Creek 3	126	3,037.8	507.3	7.3	32.2	218.6	100.5	3,904
Hospital Creek 4	127	1,607.7	324.5	6.1	27.2	120.6	74.4	2,161
Hospital Creek 5	36	55.8	203.1	0.5	2.1	15.8	2.8	280
Hospital Creek 6	36	308.5	241.7	2.2	9.8	34.4	17.3	614
Ingram Canyon 1	37	864.5	291.2	7.8	36.3	75.2	90.4	1,365
Ingram Canyon 2	37	349.4	260.1	4.4	20.8	39.5	36.7	711
Ingram Canyon 3	37	92.7	226.8	1.0	5.0	19.8	7.9	353
Ingram/Kem Canyon	37	2,086.4	291.2	9.9	47.4	150.1	112.2	2,697
Kern Canyon	40	1,271.3	284.6	2.2	9.2	94.8	21.8	1,684
Kettleman Plain 1	99	70.5	180.0	15.7	64.6	22.9	69.3	423
Kettleman Plain 2	99	41.1	173.5	9.5	39.2	17.5	39.5	320
Kettleman Plain 3	99	57.7	177.8	13.3	54.4	20.7	57.1	381
Kettleman Plain 4	99	32.0	170.1	7.2	28.8	15.6	28.9	283

Table 4, Page 2

Table 4. Cost Estimates in Millions of Dollars

Alternative Offstream Reservoir	Main Dam Number	Dam and Related Structures	Plant and Conveyance Facilities	Project Lands	Mitigation	Bond Financing	Other	Total Capital Cost
Laguna Seca Creek 1	70	354.7	270.9	5.7	27.5	40.9	33.7	733
Laguna Seca Creek 2	131	143.3	226.2	2.1	9.8	23.4	12.4	417
Laguna Seca Creek 3	73	145.2	198.4	1.0	4.8	21.2	6.9	378
Laguna Seca Creek 4	72	48.3	128.7	0.7	2.9	11.0	3.6	195
Little Panoche Creek 1	76	281.3	302.9	5.5	26.3	38.4	36.4	691
Little Panoche Creek 2	146	97.6	275.3	3.0	14.0	24.1	16.7	431
Little Salado/Crow Creek 1	63	120.4	114.7	4.9	23.3	16.8	24.8	305
Little Salado/Crow Creek 2	67	513.9	259.5	3.6	16.7	48.7	28.2	871
Little Salado/Crow Creek 3	63	35.5	101.9	3.0	13.8	9.8	13.0	177
Little Salado/Crow Creek 4	63	18.7	95.5	2.0	9.0	7.9	7.9	141
Lone Tree Creek 1	30	96.4	283.9	1.0	4.9	23.5	7.1	417
Lone Tree Creek 2	139	1,184.4	400.0	3.6	17.3	97.8	40.8	1,744
Lone Tree Creek 3	139	505.8	372.1	1.8	8.0	53.9	16.0	958
Lone Tree Creek 4	33	115.9	260.8	1.0	5.0	23.3	7.7	414
Lone Tree Creek 5	32	60.2	192.0	0.5	2.3	15.4	2.9	273
Los Banos Creek 1	181	422.5	237.9	25.2	139.5	57.6	214.9	1,098
Los Banos Creek 2	181	220.8	223.5	19.6	108.5	39.7	137.8	750
Los Banos Creek 3	181	94.9	208.0	12.4	67.0	25.8	71.5	480
Los Banos Creek 4	181	58.6	199.5	8.5	45.1	20.6	45.6	378
Los Banos Creek 5	181	24.7	182.0	2.6	13.3	13.9	12.5	249
Los Gatos Creek 1	26	3,326.5	809.8	28.8	94.8	220.0	263.0	4,743
Los Gatos Creek 2	100	2,467.7	761.2	11.2	56.4	201.9	113.7	3,612
Los Gatos Creek 3	102	238.8	766.9	2.6	12.8	62.0	19.8	1,103
Los Gatos Creek 4	103	564.5	758.1	4.2	20.6	82.1	33.0	1,463
Los Gatos Creek 5	27	32.3	646.3	1.0	5.0	41.3	4.9	731
McKittrick Valley	93	80.9	344.2	3.5	15.6	27.4	16.9	489
Moreno Gulch 1	43	1,681.6	444.3	4.9	21.1	131.1	55.6	2,339
Moreno Gulch 2	121	536.4	410.2	3.0	12.6	58.8	27.4	1,048
Moreno Gulch 3	121	170.5	383.8	1.0	4.4	33.9	7.9	602
Moreno Gulch 4	44	159.6	333.2	0.7	2.5	29.9	4.4	530
Mustang Creek	50	201.5	192.5	0.8	3.8	24.2	6.6	429
Orestimba Creek 1	171	1,314.7	240.3	9.8	46.5	100.6	107.4	1,819
Orestimba Creek 2	171	440.7	201.5	4.9	23.4	41.8	41.4	754
Orestimba Creek 3	170	730.9	321.7	9.8	46.6	69.9	91.7	1,271
Orestimba Creek 4	170	263.5	287.6	2.9	13.4	35.1	29.1	632
Orestimba Creek 5	170	53.9	248.9	1.3	6.1	19.0	9.3	339
Orestimba Creek 6	171	41.2	152.4	1.4	6.3	12.4	7.7	221
Ortigalita Creek	176	102.1	290.1	3.5	18.5	25.6	18.0	458
Oso Creek 1	138	342.3	271.0	1.7	8.2	37.9	13.3	674
Oso Creek 2	160	233.4	277.1	1.3	6.6	31.5	9.9	560

Table 4, Page 3

Table 4. Cost Estimates in Millions of Dollars

Alternative Offstream Reservoir	Main Dam Number	Dam and Related Structures	Plant and Conveyance Facilities	Project Lands	Mitigation	Bond Financing	Other	Total Capital Cost
Packwood Creek 1	79	292.1	619.0	5.2	23.6	57.8	35.4	1,033
Packwood Creek 2	130	68.4	608.7	2.6	11.2	42.0	14.2	747
Panoche Hills	132	148.6	346.8	1.8	8.0	30.8	11.6	548
Panoche/Silver Creek 1	45	1,228.8	418.2	9.4	39.4	105.3	96.2	1,897
Panoche/Silver Creek 2	111	173.8	231.6	4.6	20.8	27.1	30.7	489
Panoche/Silver Creek 3	112	859.3	264.6	10.8	51.0	75.0	106.2	1,367
Panoche/Silver Creek 4	113	930.7	339.3	11.6	49.0	83.0	82.3	1,496
Panoche/Silver Creek 5	114	2,160.9	300.9	25.9	127.4	166.4	260.2	3,042
Panoche/Silver Creek 6	111	66.2	215.3	2.7	12.3	18.4	14.8	330
Panoche/Silver Creek 7	111	112.3	222.9	3.6	16.9	22.2	22.3	400
Panoche/Silver Creek 8	112	227.8	228.1	4.8	22.3	30.3	33.3	547
Panoche/Silver Creek 9	112	427.3	243.5	7.4	34.1	45.0	58.0	815
Panoche/Silver Creek 10	45	759.4	405.6	6.9	28.5	74.5	66.8	1,342
Panoche/Silver Creek 11	45	358.3	386.8	4.3	17.7	47.4	35.9	850
Panoche/Silver Creek 12	45	63.7	350.7	1.3	5.0	25.5	7.1	453
Panoche/Silver Creek 13	113	636.1	326.4	5.7	23.3	61.1	43.2	1,096
Panoche/Silver Creek 14	113	269.6	307.0	2.1	8.5	35.9	17.4	641
Panoche/Silver Creek 15	114	1,552.8	288.1	17.2	82.9	122.9	177.3	2,241
Panoche/Silver Creek 16	114	868.6	268.7	10.4	48.8	75.5	100.5	1,373
Panoche/Silver Creek 17	114	186.5	233.2	4.4	20.4	27.9	30.4	503
Panoche/Silver Creek 18	114	69.8	217.5	2.7	12.1	18.7	14.6	335
Panoche/Silver Creek 19	112	89.3	208.4	2.7	12.1	19.3	13.8	346
Pleito Creek 1	86	7,518.0	569.1	3.4	16.2	488.6	63.4	8,659
Pleito Creek 2	118	8,399.5	661.8	9.2	46.0	553.6	193.6	9,864
Pleito Creek 3	118	5,610.1	638.7	6.4	31.2	381.0	111.4	6,779
Pleito Creek 4	118	3,115.5	615.1	3.8	18.4	227.1	56.4	4,036
Pleito Creek 5	118	1,435.4	590.2	1.8	8.9	123.1	24.9	2,184
Pleito Creek 6	118	562.5	564.3	0.9	4.1	68.3	9.8	1,210
Quinto Creek 1	54	352.0	180.3	5.6	26.0	35.4	40.0	639
Quinto Creek 2	101	482.8	261.7	4.3	20.1	47.6	39.4	856
Quinto Creek 3	54	141.2	158.5	3.0	13.6	19.7	17.2	353
Romero Creek 1	56	226.3	182.6	2.7	12.0	26.2	21.0	471
Romero Creek 2	56	106.9	165.2	1.8	8.0	17.4	11.7	311
Salado Creek 1	62	227.0	270.9	1.3	5.9	30.7	9.5	545
Salado Creek 2	135	305.7	257.0	2.1	9.0	35.0	16.3	625
Salado Creek 3	137	427.4	347.1	5.3	23.9	49.8	42.5	896
Salado Creek 4	137	111.2	317.3	1.4	6.3	26.5	8.4	471
Salt Creek 1-Fresno Co.	24	697.6	434.4	4.3	20.2	70.9	39.4	1,267
Salt Creek 2-Fresno Co.	24	565.7	428.7	3.6	16.9	62.1	33.6	1,111
Salt Creek 3-Fresno Co.	24	227.3	405.5	1.7	7.7	39.0	13.2	694

Table 4. Cost Estimates in Millions of Dollars

Alternative Offstream Reservoir	Main Dam Number	Dam and Related Structures	Plant and Conveyance Facilities	Project Lands	Mitigation	Bond Financing	Other	Total Capital Cost
Salt Creek 1-Kern Co.	91	1,295.3	526.1	2.1	8.8	110.9	25.7	1,969
Salt Creek 2-Kern Co.	134	1,142.8	385.4	2.2	9.5	93.4	28.7	1,662
Salt Creek 3-Kern Co.	134	346.0	353.3	1.0	4.4	42.7	10.5	758
Salt Creek 1-Merced Co.	1	20.4	172.7	2.7	13.2	13.1	12.8	235
Salt Creek 2-Merced Co.	148	38.2	186.8	3.4	16.3	15.3	15.5	276
San Emigdio Creek 1	77	608.6	555.0	1.6	6.8	70.8	11.6	1,254
San Emigdio Creek 2	120	3,197.9	612.8	3.3	14.5	231.8	61.2	4,122
San Luis Creek 1	143	1,667.2	340.6	8.5	39.3	127.1	107.1	2,290
San Luis Creek 2	143	1,292.6	328.5	7.0	32.6	102.5	80.2	1,843
San Luis Creek 3	143	728.8	309.4	4.7	22.1	65.7	48.6	1,179
San Luis Creek 4	143	121.7	261.2	1.3	6.1	23.8	9.0	423
San Luis Creek 5	145	372.1	259.1	3.6	16.9	40.3	30.5	723
San Luis Creek 6	145	116.5	235.5	2.1	9.4	22.3	13.6	399
Sandy Creek	92	145.3	143.6	1.7	7.8	18.3	8.9	326
Santiago Creek 1	19	2,354.8	646.5	3.1	14.2	182.6	40.8	3,242
Santiago Creek 2	19	803.6	621.7	1.7	7.5	86.6	15.1	1,536
Sunflower Valley 1	177	127.2	363.9	18.5	90.1	39.9	95.1	735
Sunflower Valley 2	177	80.3	358.4	14.0	67.1	34.0	66.6	620
Sunflower Valley 3	177	46.1	352.7	9.6	46.0	29.1	42.2	526
Sunflower Valley 4	177	21.5	346.9	5.6	26.1	25.0	22.3	447
Wildcat Canyon	74	167.6	295.9	2.1	8.6	28.9	11.8	515

divided by 17,000 acres). The project lands cost of each alternative was estimated by multiplying this unit price by the total project land area.

Pumping/Generating Facility

The cost of pump/generating facilities for all alternatives was estimated based on the lift required from the California Aqueduct to a typical operating water surface elevation of the reservoir. A maximum pumping capacity of 3,500 cfs was assumed for all alternatives.

Based on the assumption of a more aggressive operation, LBG's minimum normal operating water surface elevation was lowered from the one presented in the 1990 Feasibility Study Report. For the 1990 report, the target carryover storage was set at 800,000. For this study, the assumption was made that this target carryover storage would be reduced; therefore, the design pumping head could be lowered to 80 percent of the design pumping head used in the 1990 report. The calculated power requirement under these circumstances would be lower than the power requirement used for the original design of the pumping units. The ratio of the design power requirement to calculated power requirement was estimated to be 1.18. Using this ratio and the maximum pumplift for each alternative, the design power requirement could be calculated.

The following equations, using empirical factors, summarizes the design power calculations:

$$HP = (\text{flow}/8.841) \times \text{pumplift}$$

$$\text{Power} = HP \times (0.7457/1000)$$

$$\text{Design Power} = 0.8 \times \text{Power} \times 1.18$$

where

HP is horsepower

flow is in cfs

pumplift is in feet

Power and Design Power are in MW

0.8 is ratio of design head to maximum lift

1.18 is ratio of design power requirement to calculated power requirement.

With the inlet flow capacity set at 3,500 cfs, the above equation can be expressed as:

$$\text{Design Power} = \text{pumplift} \times 0.278$$

A curve relating pump/generating plant costs to design power for pumping was developed using cost estimates for selected pumping and generating facilities. These facilities are Edward Hyatt Powerplant, Thermalito Powerplant, LBG P/G Plant No.1, LBG P/G Plant No.2, and San Luis P/G Plant. Estimated costs of these facilities were updated to 1996 costs (see Table 5).

Table 5. Updated Costs for Selected Pumping/Generating Plants

Pumping/Generating Plant	Maximum Power Required for Pumping (MW)	Estimated Cost 1996 Dollars (\$ Millions)
Edward Hyatt Powerplant	774	410
Los Banos Grandes P/G Plant No. 1	44	76
Los Banos Grandes P/G Plant No. 2	128	168
San Luis P/G Plant	376	321
Thermalito Powerplant	119	159

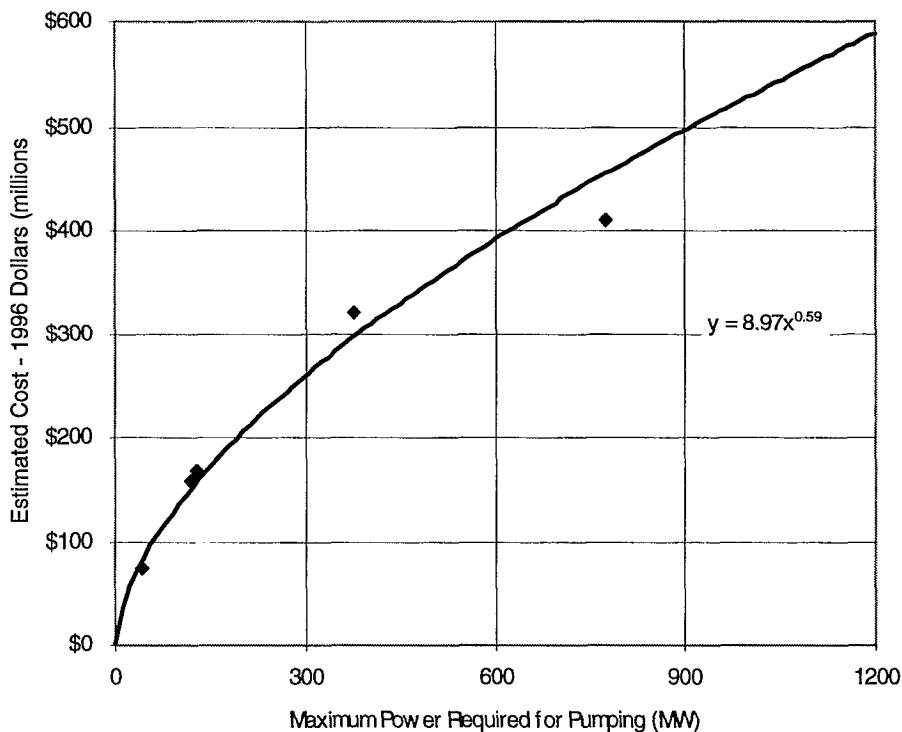
Based on these estimates, an empirical relationship between design power and cost was developed (see Figure 3). This equation is:

$$\text{Cost} = 8.97 \times (\text{Design Power})^{0.59}$$

where

Cost is in millions of dollars

Design Power is in MW.

Figure 3. Power Requirement Versus Cost

Penstocks

The cost of penstocks was estimated based on the height of the dam. The cost of LBG penstocks is estimated at \$10,600,000 for a 414-foot high dam, which yields a unit cost of \$25,600 per foot of dam height. The cost of penstocks for each alternative was estimated by multiplying this unit cost by the dam height.

Conveyance Facilities

The cost estimates for conveyance facilities were based on the distance from the main dam to the California Aqueduct. The estimates assume a constant conveyance capacity for all alternatives. The cost of lined channel for LBG is estimated at \$24,100,000 for 5,800 feet of channel, or \$4,200 per linear foot. The cost for each conveyance channel was estimated based on this unit cost and the total distance from the California Aqueduct.

Outlet Works

For previous LBG studies, Division of Safety of Dams' standards for lowering the reservoir by 10 percent of the active depth in ten days was used to estimate emergency release facility costs. Consequently, the emergency evacuation flow rate controls the design of the outlet works. The cost for outlet works was estimated according to the storage capacity of each reservoir. The total cost of the LBG outlet works was estimated at \$104,100,000 for a storage capacity of 1,728,000 acre-feet. Therefore, the ratio of cost to storage capacity yields a unit cost of \$60 per acre-foot of storage. The cost of the outlet works for each alternative was estimated using this unit cost multiplied by the corresponding storage capacity.

Emergency Release Distribution Facilities

The emergency release distribution facilities consist of conveyance structures to route the water released during emergency situations to safe areas away from the project's location. For this study, the simplifying assumption was made that total capital cost of emergency release distribution facilities was related to storage capacity of the reservoir. Total cost of LBG emergency release facilities is \$5,400,000 for a storage capacity of 1,728,000 AF. This yields a unit cost of \$3.13 per acre-foot of storage capacity. The costs for the alternative reservoirs' emergency release distribution facilities were estimated from this unit cost.

General Reservoir Costs

General reservoir costs are those associated primarily with initiation of project construction activities, such as relocating historical buildings and setting construction headquarters. These costs were related to maximum water surface area. The general reservoir costs of the LBG facilities are estimated at \$21,600,000 for a maximum water surface area of 12,870 acres, resulting in a unit cost of \$1,700 per acre. The general reservoir costs were calculated by multiplying this unit cost by the water surface area of each alternative.

Roads

The estimated cost of roads for the alternative sites was related to the maximum water surface area. The cost of the roads for LBG facilities was \$34,800,000 for a maximum water surface area of 12,870 acres, resulting in a unit cost of \$2,700 per acre. The cost of roads for each alternative site was estimated based on this unit cost multiplied by the corresponding maximum surface area.

Mitigation Costs

Mitigation costs were estimated based on the maximum inundated area and the environmental sensitivity ratings covered in the next section. These estimates assume that alternatives with less environmental impacts would have lower unit mitigation costs. A unit cost adjustment factor for mitigation was estimated for each alternative site based on a straight-line relationship with the environmental sensitivity rating (see Environmental Rating Section). A unit cost adjustment factor of 1.0 was assumed for LBG (environmental sensitivity rating = 31), and a factor of 0.5 for the "best" environmental alternative (environmental sensitivity rating = 86). Accordingly, a unit cost adjustment factor curve was developed with the following equation:

$$\text{Unit Cost Adjustment Factor} = 1.28 - 0.00909 \text{ (Environmental Sensitivity Rating)}$$

The estimated mitigation cost of LBG with maximum water surface area of 12,870 acres is \$122,400,000. The ratio of cost to area yields a unit cost of \$9,500 per acre of maximum water surface area. The total mitigation cost of each alternative site was estimated by multiplying the unit cost adjustment factor, the mitigation unit cost, and the maximum water surface area.

Recreation Costs

The cost of the recreation facilities was estimated based on the maximum surface area. Los Banos Grandes, with a maximum surface area of 12,870 acres, has an estimated recreation cost of \$14,700,000. Consequently, the ratio of costs to surface area is \$1,100 per acre. The costs of the recreation facilities of each alternative were estimated by multiplying this factor by the maximum surface area.

Initial Filling Costs

The estimated cost of filling the reservoir to an operational level was based on storage capacity. To be operational, it was assumed that any reservoir should be one-third full. The estimated cost of LBG's initial filling is \$54,500,000 for a storage capacity of 1,728,000 acre-feet, or \$32 per acre-foot. The cost of the initial filling for each alternative is this unit cost multiplied by the storage capacity.

Bond Financing Costs

Bond financing costs only apply to the cost for the portion of the facilities that is required for SWP water supply operations. This cost was estimated based on total project cost. The bond financing cost and total project cost of the LBG facilities are \$52,800,000 and \$875,400,000, respectively. The ratio of bond financing cost to total project cost is 0.06. The cost of bond financing for each alternative site was estimated by multiplying 0.06 by the corresponding total project cost. Recreation and flood control costs are not included in the calculation of total project cost.

Miscellaneous Costs

Miscellaneous costs include all costs not included in other categories. These costs were estimated based on the storage capacity of the alternatives. The estimated miscellaneous costs for LBG are \$60,700,000 for a storage capacity of 1,728,000 acre-feet. Therefore, the estimated unit cost is \$35 per acre foot of storage capacity. The miscellaneous costs of the alternative reservoirs were estimated from this unit cost.

Summary of Cost Estimating Procedures

A summary of the procedures used to estimate the various components of capital cost is presented in the Table 6. Costs shown in the table are estimated 1995 values.

Table 6. Determination of Capital Cost

Capital Cost Component	Assumption Based on Relation to:	1990 Amount for Los Banos Grandes	1990 Cost for Los Banos Grandes	1995 Cost for Los Banos Grandes	Unit Cost Applied to Other Alternatives in Phase I
Embankment Construction	Total Embankment	23,000,000 cy	\$188,520,000	\$207,400,000	\$9.02/cy
Spillway	Height of Dam	414 ft	\$19,017,000	\$20,900,000	\$50,500/ft
Project Lands	Ratio of Maximum Water Surface Area to Required Project Lands	17,000 ac	\$22,400,000	\$22,400,000	\$1,300/acre
Pumping-Generating Facility	Maximum Pump Lift and Power Requirement	See Figure 3	---	---	---
Penstocks	Height of Dam	414 ft	\$9,655,000	\$10,600,000	\$25,600/ft
Conveyance Facilities	Distance from California Aqueduct	5,800 ft	\$22,395,000	\$24,100,000	\$4,200/ft
Outlet Works	Storage Volume	1,728,000 af	\$96,692,000	\$104,100,000	\$60/af
Emergency Release Facilities	Storage Volume	1,728,000 af	\$4,923,000	\$5,400,000	\$3.13/af
General Reservoir	Maximum Water Surface Area	12,870 ac	\$19,600,000	\$21,600,000	\$1,700/ac
Miscellaneous	Storage Volume	1,728,000 af	\$55,200,000	\$60,700,000	\$35/af
Roads	Maximum Water Surface Area	12,870 ac	\$31,300,000	\$34,800,000	\$2,700/ac
Mitigation	Area Inundated and Environmental Sensitivity Factor	12,870 ac	\$117,300,000	\$122,400,000	---
Recreation	Maximum Water Surface Area	12,870 ac	\$13,500,000	\$14,700,000	\$1,100/ac
Initial Filling	Storage Volume	1,728,000 af	\$54,500,000	\$54,500,000	\$32/af
Bond Financing	Total Project Cost	\$875,400,000	\$52,800,000	\$52,800,000	\$0.06/\$

Rating of Alternatives Based on Engineering and Economic Factors

A rating of the alternatives was performed based on estimated capital costs per acre-foot of storage. As a first step in screening the alternative reservoir sites, clearly impracticable alternatives were eliminated. After a review of costs paid or committed to recently by SWP contractors for new storage projects and an assessment of estimated costs of alternative water supplies, it was determined that unit storage costs¹ above \$3,000 per acre-foot were clearly impracticable. In fact, it appears unlikely that SWP contractors would be willing and able to pay costs approaching this limit. Setting the threshold value at \$3,000 per acre-foot of storage -- well above the practicable limit -- prevented elimination of alternatives that: (1) might provide significant environmental advantages, or (2) may have overestimated cost estimates due to the simplifying assumptions used for the Phase One evaluation.

After elimination of alternatives with unit storage costs above the practicable threshold, 33 damsites in 18 watersheds were retained for further consideration in Phase One. The unit storage cost for each of these remaining alternatives was translated to a 0 to 100 point rating system, with 0 points assigned to a unit cost of \$3,000 (and above) per acre-foot of storage, and 100 points to a unit cost of \$0 per acre-foot of storage. Unit costs and scores were developed for a number of reservoir sizes at each damsite to cover the potential range of storage volumes available at each damsite. The resulting rating of engineering and economic factors (cost rating) is shown in Table 7.

The unit costs and scores for the reservoir sizes evaluated at each damsite were plotted versus storage volume. Curves were drawn through the discrete points associated with each damsite to allow interpolation of this information for the entire range of storage volumes available at each damsite. Figure 4 shows unit cost versus storage volume for all

¹ Unit storage cost should not be confused with cost of project yield. Unit storage cost is the present worth project cost (one time cost) paid to provide storage capacity for the life of the project. Unit cost of project yield is the annualized project cost allocated to the annual water supplies provided by the project. Water supply benefits must be projected to estimate unit cost of project yield.

Table 7. Rating of Engineering and Economic Factors

Alternative Offstream Reservoir	Main Dam Number	Normal Pool Storage Capacity (TAF)	Total Capital Cost (\$ million)	Cost per Acre-Foot of Storage (\$/AF)	Cost Rating 100: \$0/AF 0: \$3,000/AF (0-100)
Arroyo Ciervo 1	4	278	2,067	7,440	Disqualified
Arroyo Ciervo 2	4	105	1,157	11,020	Disqualified
Arroyo Hondo 1	7	896	4,137	4,620	Disqualified
Arroyo Hondo 2	7	641	3,290	5,130	Disqualified
Arroyo Hondo 3	14	674	2,277	3,380	Disqualified
Arroyo Hondo 4	14	456	1,779	3,900	Disqualified
Arroyo Hondo 5	7	356	2,340	6,570	Disqualified
Arroyo Hondo 6	7	100	1,206	12,060	Disqualified
Arroyo Hondo 7	14	232	1,232	5,310	Disqualified
Arroyo Hondo 8	11	75	592	7,890	Disqualified
Bitter Creek 1	16	192	921	4,800	Disqualified
Bitter Creek 2	17	462	3,677	7,960	Disqualified
Bitter Creek 3	123	101	1,174	11,620	Disqualified
Bitterwater Valley 1	18	396	1,319	3,330	Disqualified
Bitterwater Valley 2	128	145	1,040	7,170	Disqualified
Bitterwater Valley 3	128	40	877	21,930	Disqualified
Broad Creek	98	31	358	11,550	Disqualified
Buena Vista Creek	97	59	476	8,070	Disqualified
Buena Vista Lake Bed	-	91	314	3,450	Disqualified
Cantua Creek 1	116	1,327	8,242	6,210	Disqualified
Cantua Creek 2	20	614	1,689	2,750	8
Cantua Creek 3	22	249	879	3,530	Disqualified
Cantua Creek 4	21	82	509	6,210	Disqualified
Cantua Creek 5	116	513	4,092	7,980	Disqualified
Cantua Creek 6	116	117	1,593	13,620	Disqualified
Cantua Creek 7	20	150	701	4,670	Disqualified
Capita Canyon	42	27	621	23,000	Disqualified
Castac Valley 1	47	826	3,044	3,690	Disqualified
Castac Valley 2	117	1,206	8,364	6,940	Disqualified
Castac Valley 3	117	641	4,865	7,590	Disqualified
Castac Valley 4	117	317	2,648	8,350	Disqualified
Castac Valley 5	117	135	1,375	10,190	Disqualified
Deep Gulch	28	58	395	6,810	Disqualified
Del Puerto Canyon 1	191	88	223	2,530	16
Del Puerto Canyon 2	193	94	371	3,950	Disqualified
Del Puerto Canyon 3	194	191	657	3,440	Disqualified
Del Puerto Canyon 4	193	35	251	7,170	Disqualified
Del Puerto Canyon 5	194	71	399	5,620	Disqualified

Table 7. Rating of Engineering and Economic Factors

Alternative Offstream Reservoir	Main Dam Number	Normal Pool Storage Capacity (TAF)	Total Capital Cost (\$ million)	Cost per Acre-Foot of Storage (\$/AF)	Cost Rating 100: \$0/AF 0: \$3,000/AF (0-100)
Garzas Creek 1	104	1,754	2,295	1,310	56
Garzas Creek 2	105	628	1,045	1,660	45
Garzas Creek 3	106	312	567	1,820	39
Garzas Creek 4	107	262	503	1,920	36
Garzas Creek 5	108	574	1,200	2,090	30
Garzas Creek 6	109	939	1,623	1,730	42
Garzas Creek 7	108	346	871	2,520	16
Garzas Creek 8	108	138	452	3,280	Disqualified
Garzas Creek 9	109	599	1,241	2,070	31
Garzas Creek 10	109	277	733	2,650	12
Garzas Creek 11	109	163	543	3,330	Disqualified
Garzas Creek 12	105	380	815	2,140	29
Garzas Creek 13	105	289	695	2,400	20
Garzas Creek 14	106	139	361	2,600	13
Garzas Creek 15	106	194	439	2,260	25
Garzas Creek 16	107	24	166	6,920	Disqualified
Garzas Creek 17	107	75	263	3,510	Disqualified
Garzas Creek 18	104	1,202	1,725	1,440	52
Garzas Creek 19	104	628	1,187	1,890	37
Garzas Creek 20	104	379	862	2,270	24
Garzas Creek 21	104	149	518	3,480	Disqualified
Garzas Creek 22	104	72	405	5,630	Disqualified
Garzas Creek 23	104	86	430	5,000	Disqualified
Garzas Creek 24	106	79	290	3,670	Disqualified
Garzas Creek 25	108	79	348	4,410	Disqualified
Hospital Creek 1	35	385	1,126	2,920	3
Hospital Creek 2	124	552	1,610	2,920	3
Hospital Creek 3	126	1,155	3,904	3,380	Disqualified
Hospital Creek 4	127	820	2,161	2,640	12
Hospital Creek 5	36	18	280	15,560	Disqualified
Hospital Creek 6	36	152	614	4,040	Disqualified
Ingram Canyon 1	37	977	1,365	1,400	53
Ingram Canyon 2	37	333	711	2,140	29
Ingram Canyon 3	37	67	353	5,270	Disqualified
Ingram/Kern Canyon	37	1,201	2,697	2,250	25
Kern Canyon	40	223	1,684	7,550	Disqualified
Kettleman Plain 1	99	283	423	1,490	50
Kettleman Plain 2	99	133	320	2,410	20
Kettleman Plain 3	99	220	381	1,730	42
Kettleman Plain 4	99	89	283	3,180	Disqualified

Table 7. Rating of Engineering and Economic Factors

Alternative Offstream Reservoir	Main Dam Number	Normal Pool Storage Capacity (TAF)	Total Capital Cost (\$ million)	Cost per Acre-Foot of Storage (\$/AF)	Cost Rating 100: \$0/AF 0: \$3,000/AF (0-100)
Laguna Seca Creek 1	70	228	733	3,210	Disqualified
Laguna Seca Creek 2	131	85	417	4,910	Disqualified
Laguna Seca Creek 3	73	53	378	7,130	Disqualified
Laguna Seca Creek 4	72	24	195	8,130	Disqualified
Little Panoche Creek 1	76	279	691	2,480	17
Little Panoche Creek 2	146	107	431	4,030	Disqualified
Little Salado/Crow Creek 1	63	132	305	2,310	23
Little Salado/Crow Creek 2	67	250	871	3,480	Disqualified
Little Salado/Crow Creek 3	63	49	177	3,610	Disqualified
Little Salado/Crow Creek 4	63	22	141	6,410	Disqualified
Lone Tree Creek 1	30	53	417	7,870	Disqualified
Lone Tree Creek 2	139	432	1,744	4,040	Disqualified
Lone Tree Creek 3	139	155	958	6,180	Disqualified
Lone Tree Creek 4	33	63	414	6,570	Disqualified
Lone Tree Creek 5	32	19	273	14,370	Disqualified
Los Banos Creek 1	181	2,000	1,098	550	82
Los Banos Creek 2	181	1,117	750	670	78
Los Banos Creek 3	181	477	480	1,010	66
Los Banos Creek 4	181	276	378	1,370	54
Los Banos Creek 5	181	67	249	3,720	Disqualified
Los Gatos Creek 1	26	2,500	4,739	1,900	37
Los Gatos Creek 2	100	1,167	3,612	3,100	Disqualified
Los Gatos Creek 3	102	170	1,103	6,490	Disqualified
Los Gatos Creek 4	103	295	1,463	4,960	Disqualified
Los Gatos Creek 5	27	24	731	30,460	Disqualified
McKittrick Valley	93	89	489	5,490	Disqualified
Moreno Gulch 1	43	598	2,339	3,910	Disqualified
Moreno Gulch 2	121	265	1,048	3,950	Disqualified
Moreno Gulch 3	121	68	602	8,850	Disqualified
Moreno Gulch 4	44	36	530	14,720	Disqualified
Mustang Creek	50	60	429	7,150	Disqualified
Orestimba Creek 1	171	1,137	1,819	1,600	47
Orestimba Creek 2	171	378	754	1,990	34
Orestimba Creek 3	170	900	1,271	1,410	53
Orestimba Creek 4	170	295	632	2,140	29
Orestimba Creek 5	170	75	339	4,520	Disqualified
Orestimba Creek 6	171	48	221	4,600	Disqualified
Ortigalita Creek	176	100	458	4,580	Disqualified
Oso Creek 1	138	116	674	5,810	Disqualified
Oso Creek 2	160	83	560	6,750	Disqualified

Table 7, Page 3

Table 7. Rating of Engineering and Economic Factors

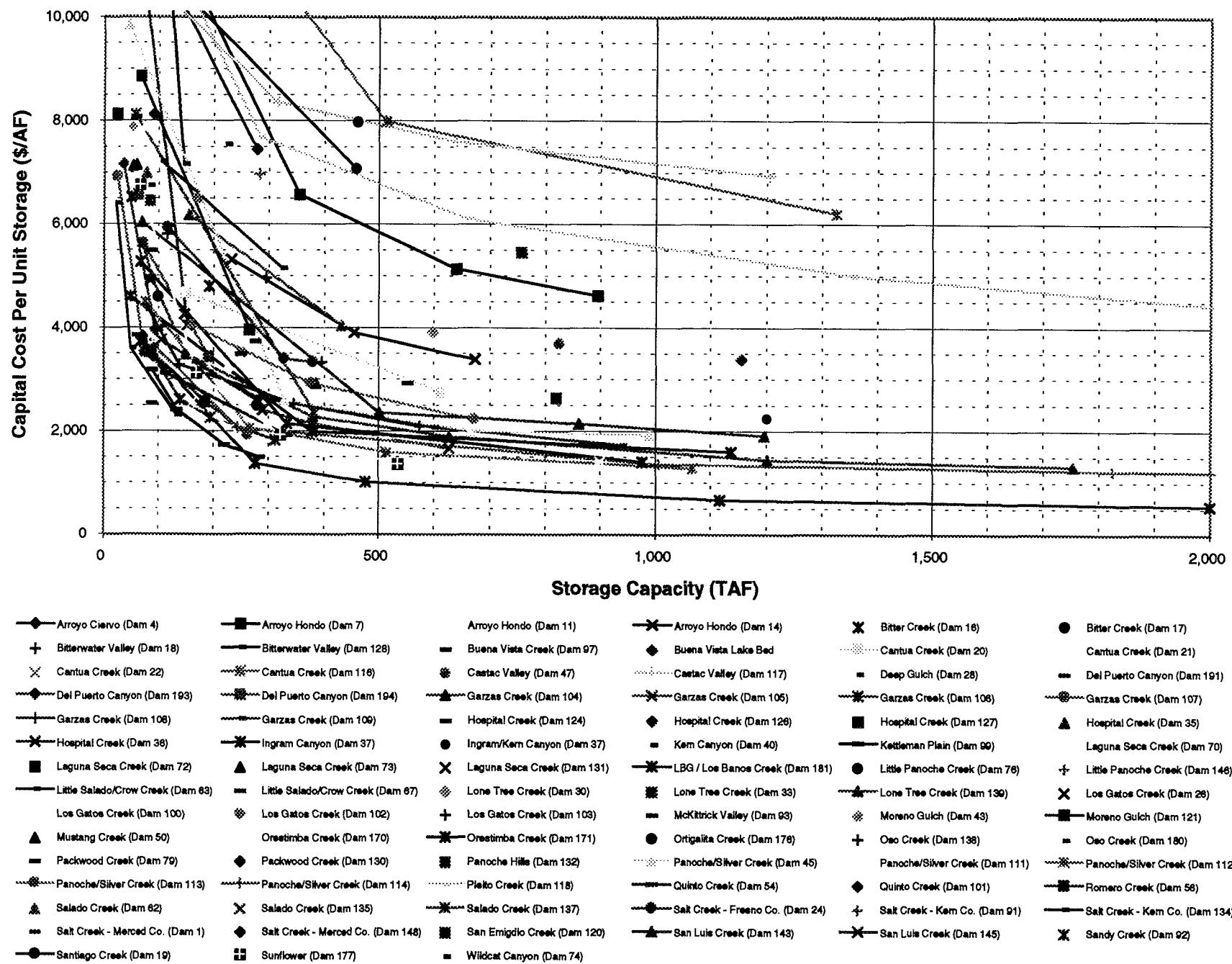
Alternative Offstream Reservoir	Main Dam Number	Normal Pool Storage Capacity (TAF)	Total Capital Cost (\$ million)	Cost per Acre-Foot of Storage (\$/AF)	Cost Rating 100: \$0/AF 0: \$3,000/AF (0-100)
Packwood Creek 1	79	277	1,033	3,730	Disqualified
Packwood Creek 2	130	92	747	8,120	Disqualified
Panoche Hills	132	85	548	6,450	Disqualified
Panoche/Silver Creek 1	45	989	1,897	1,920	36
Panoche/Silver Creek 2	111	242	489	2,020	33
Panoche/Silver Creek 3	112	1,068	1,367	1,280	57
Panoche/Silver Creek 4	113	672	1,496	2,230	26
Panoche/Silver Creek 5	114	2,647	3,042	1,150	62
Panoche/Silver Creek 6	111	91	330	3,630	Disqualified
Panoche/Silver Creek 7	111	158	400	2,530	16
Panoche/Silver Creek 8	112	265	547	2,060	31
Panoche/Silver Creek 9	112	514	815	1,590	47
Panoche/Silver Creek 10	45	667	1,342	2,010	33
Panoche/Silver Creek 11	45	328	850	2,590	14
Panoche/Silver Creek 12	45	46	453	9,850	Disqualified
Panoche/Silver Creek 13	113	375	1,096	2,920	3
Panoche/Silver Creek 14	113	158	641	4,060	Disqualified
Panoche/Silver Creek 15	114	1,825	2,241	1,230	59
Panoche/Silver Creek 16	114	1,006	1,373	1,360	55
Panoche/Silver Creek 17	114	244	503	2,060	31
Panoche/Silver Creek 18	114	92	335	3,640	Disqualified
Panoche/Silver Creek 19	112	77	346	4,490	Disqualified
Pleito Creek 1	86	783	8,659	11,060	Disqualified
Pleito Creek 2	118	2,447	9,864	4,030	Disqualified
Pleito Creek 3	118	1,357	6,779	5,000	Disqualified
Pleito Creek 4	118	662	4,036	6,100	Disqualified
Pleito Creek 5	118	284	2,184	7,690	Disqualified
Pleito Creek 6	118	104	1,210	11,630	Disqualified
Quinto Creek 1	54	332	639	1,920	36
Quinto Creek 2	101	381	856	2,250	25
Quinto Creek 3	54	113	353	3,120	Disqualified
Romero Creek 1	56	184	471	2,560	15
Romero Creek 2	56	88	311	3,530	Disqualified
Salado Creek 1	62	78	545	6,990	Disqualified
Salado Creek 2	135	147	625	4,250	Disqualified
Salado Creek 3	137	382	896	2,350	22
Salado Creek 4	137	58	471	8,120	Disqualified
Salt Creek 1-Fresno Co.	24	380	1,267	3,330	Disqualified
Salt Creek 2-Fresno Co.	24	328	1,111	3,390	Disqualified
Salt Creek 3-Fresno Co.	24	117	694	5,930	Disqualified

Table 7. Rating of Engineering and Economic Factors

Alternative Offstream Reservoir	Main Dam Number	Normal Pool Storage Capacity (TAF)	Total Capital Cost (\$ million)	Cost per Acre-Foot of Storage (\$/AF)	Cost Rating 100: \$0/AF 0: \$3,000/AF (0-100)
Salt Creek 1-Kern Co.	91	283	1,969	6,960	Disqualified
Salt Creek 2-Kern Co.	134	323	1,662	5,150	Disqualified
Salt Creek 3-Kern Co.	134	105	758	7,220	Disqualified
Salt Creek 1-Merced Co.	1	61	235	3,850	Disqualified
Salt Creek 2-Merced Co.	148	72	276	3,830	Disqualified
San Emigdio Creek 1	77	101	1,254	12,420	Disqualified
San Emigdio Creek 2	120	757	4,122	5,450	Disqualified
San Luis Creek 1	143	1,196	2,290	1,910	36
San Luis Creek 2	143	862	1,843	2,140	29
San Luis Creek 3	143	501	1,179	2,350	22
San Luis Creek 4	143	70	423	6,040	Disqualified
San Luis Creek 5	145	282	723	2,560	15
San Luis Creek 6	145	106	399	3,760	Disqualified
Sandy Creek	92	50	326	6,520	Disqualified
Santiago Creek 1	19	459	3,242	7,060	Disqualified
Santiago Creek 2	19	147	1,536	10,450	Disqualified
Sunflower Valley 1	177	535	735	1,370	54
Sunflower Valley 2	177	322	620	1,930	36
Sunflower Valley 3	177	168	526	3,130	Disqualified
Sunflower Valley 4	177	66	447	6,770	Disqualified
Wildcat Canyon	74	79	515	6,520	Disqualified

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Figure 4. Unit Cost versus Storage Volume



damsites evaluated in Phase One. Figure 5 depicts cost rating versus storage volume for reservoirs with unit cost below \$3,000 per acre-foot of storage.

Environmental Sensitivity

The first step in determining the Phase One environmental sensitivity rating of alternatives was to develop a set of rating criteria. Through Interagency Agreement B-59290, Department staff coordinated with the California Department of Fish and Game, Bay-Delta and Special Water Projects Division, to develop a rating process that would utilize existing information from publications, databases, maps, and aerial photographs. It was agreed that the primary environmental factors considered would be vegetation and wildlife (including threatened and endangered species), habitat diversity, and total area that would be affected by a new reservoir. After developing specific rating criteria, DWR and CDFG staff briefed U.S. Fish and Wildlife Service staff and made minor adjustments based on comments received.

Six factors were used for the environmental sensitivity rating:

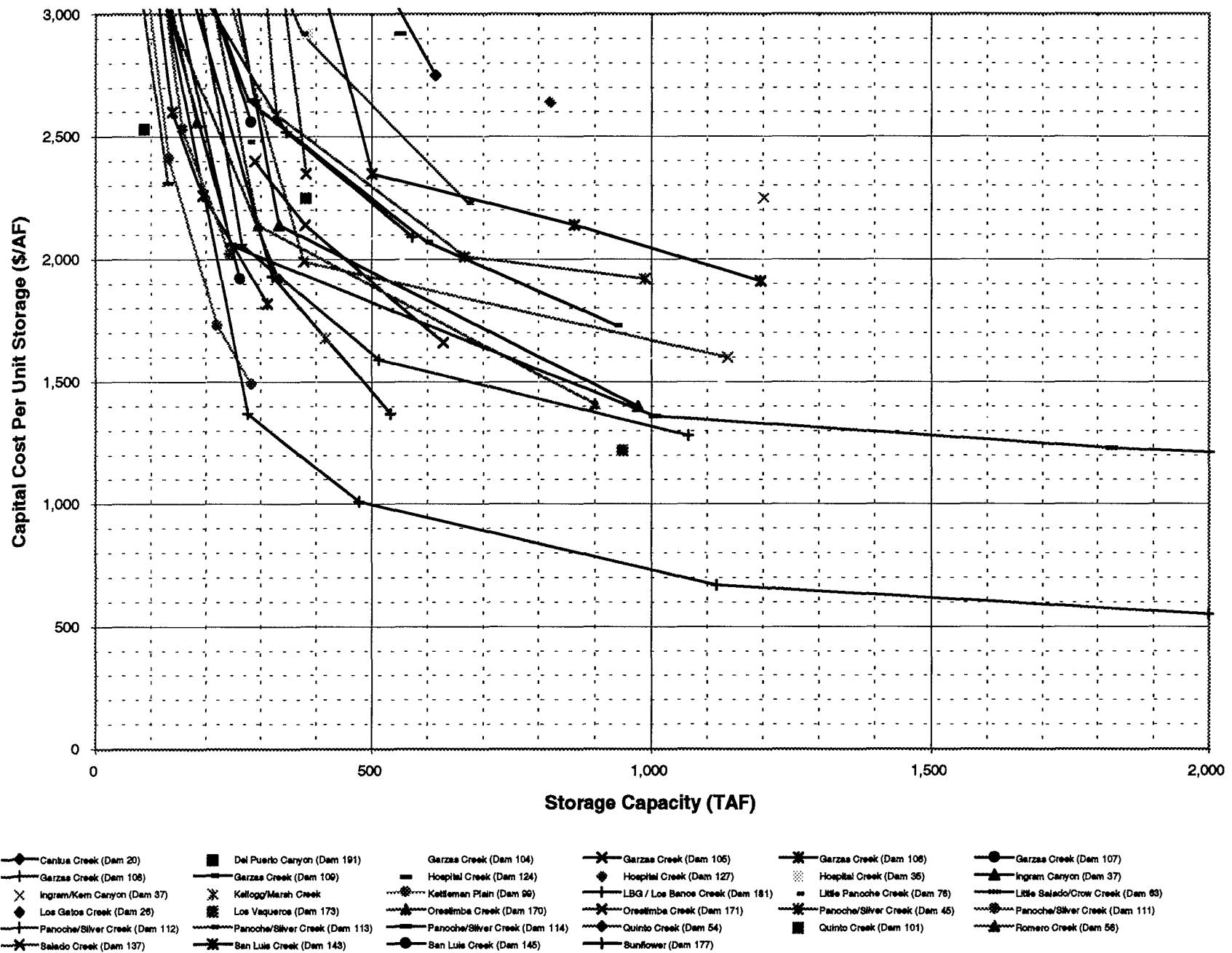
- Wetland abundance and type
- Vegetation community abundance and type
- Number of potential sensitive wildlife species
- Number of potential rare, threatened, and endangered wildlife species
- Habitat diversity
- Total area that would be inundated

The degree of available environmental information varied widely among the sites. To ensure that all of the alternatives were evaluated equally, all sites were rated using the same level of detail for each of the screening criteria. In evaluating wetland resources, the USFWS National Wetland Inventory Maps were used to determine wetland abundance and types at the alternative sites. The U. S. Geological Survey's National Aerial Photographic Project maps (1:40,000, 1987-93) were used to determine vegetation community abundance and type, and to obtain additional habitat and land use information. Listed and candidate animal and plant species that could potentially be found at the alternative sites were

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Figure 5. Capital Cost per Unit Storage versus Storage Capacity



● identified by searching the 1995 CDFG Natural Diversity Data Base (RAREFIND), the fifth edition of the California Native Plant Society's inventory of rare and endangered vascular plants of California, and the CDFG Wildlife Habitat Relationships System publications "California's Wildlife," Volumes I to III.

For environmental evaluation purposes, it was decided that only the configuration with the highest water surface elevation and/or the largest area of inundation would be studied for each alternative site (other than for the area inundated criteria).

Environmental Sensitivity Rating Scale

Alternative reservoir sites were assigned a score ranging from zero to four points for each of the six criteria. A score of four corresponds with no potential for significant environmental impact; a score of three corresponds with a potentially low environmental impact; a score of two corresponds with a potentially moderate environmental impact; a score of one corresponds with a potentially high environmental impact; and a score of zero corresponds with a potentially unacceptable and impossible-to-mitigate environmental impact. To determine the level of potential impact at each of the alternative sites, general criteria were specifically defined for each of the six environmental screening factors. A higher score for an alternative reservoir site translates to a lower environmental impact.

Wetlands Rating Criteria and Weighting Value

A site received a score in the "Wetlands" category based on the following criteria:

- Four points if no wetlands could be expected at a site
- Three points if the site has small or minor wetlands in narrow riparian strips, small farm ponds (less than two acres in size), and intermittent creeks or drainage channels
- Two points if small wetland areas are present along permanent stream channels or farm ponds greater than two acres in size
- One point if the site supports significant wetlands associated with stream channels, marsh areas, and vernal pools

- Zero points if constructing a reservoir at this site would substantially degrade or destroy a significant wetland area and result in an irretrievable loss of associated environmental values

After the wetland score for the alternative was determined, a weighting factor of six was applied to that score (example: wetlands score = 2 x 6 = a final score of 12 points).

Vegetation Rating Criteria and Weighting Value

Sites received scores in the "Vegetation" category based on the following criteria:

- Four points if over 90 percent of the area consists of irrigated agriculture or has been disturbed by human activities (including urban and industrial activities)
- Three points if the site has one dominate cover (over 80 percent), such as non-native grassland and no special vegetation (riparian or woodland)
- Two points if the site could support one to three special vegetation communities, or one to five "Species of Special Concern" or "Candidate Species," as defined by the RAREFIND Report
- One point if the site could support four or more special vegetation communities, or six or more species of special concern or "Candidate Species," as defined by the RAREFIND Report
- Zero points if construction of a reservoir at this site would result in irretrievable losses to special vegetation communities and their associated wildlife values

Once the vegetation score for the alternative was determined, a weighting factor of four was applied to that score (example: vegetation score = 2 x 4 = final score of eight points).

Wildlife Rating Criteria and Weighting Value

Sites received scores in the "Wildlife" category based on the following criteria:

- Four points if there are essentially no sensitive species present
- Three points if the area is low in habitat complexity (generally one or two low value habitat types present), and could support sensitive species

- Two points if one to five species of special concern or candidate species are potentially present
- One point if six or more species of special concern or candidate species are potentially present
- Zero points if construction of a reservoir at this site would eliminate a fish or wildlife population or cause it to drop below self-sustaining levels

Once the wildlife score for the alternative was determined, a weighting factor of four was applied to that score (example: wildlife score = 2×4 = a final score of eight points).

Threatened and Endangered Species Rating Criteria and Weighting Value

Sites received scores on the "Threatened and Endangered Species" category based on the following criteria:

- Four points if no threatened or endangered species are present in the area
- Three points if one threatened or endangered species is potentially present
- Two points if two threatened or endangered species are potentially present
- One point if three or more threatened or endangered species are potentially present
- Zero points if construction of a reservoir at this site would knowingly jeopardize the continued existence or significantly reduce the range of a rare or endangered plant or animal

Once the threatened and endangered species score for the alternative was determined, a weighting factor of six was applied to that score (example: endangered species score = 2×6 = a final score of 12 points).

Habitat Diversity Rating Criteria and Weighting Value

Sites received scores for the "Habitat Diversity" category based on the following criteria:

- Four points if over 90 percent of the total habitat at a site has been disturbed by agricultural, urban, or industrial activities

- Three points if over 90 percent of the total habitat at the site is of one type, such as non-native grassland
- Two points if the site potentially supports two to four different types of habitat
- One point if the site potentially supports five or more different types of habitat
- Zero points if construction of a reservoir at this site would eliminate significant amounts of different types of habitat and cause significant irretrievable losses to wildlife

Once the habitat diversity score for the alternative was determined, a weighting factor of three was applied to that score (example: habitat diversity score = 2×3 = a final score of six points).

Acres Inundated Rating Criteria and Weighting Value

Sites received scores in the "Acres Inundated" category according to the following criteria:

- Four points if less than 2,000 acres would be inundated
- Three points if more than 2,000 but less than 5,000 acres would be inundated
- Two points if more than 5,000 but less than 10,000 acres would be inundated
- One point if more than 10,000 but less than 15,000 acres would be inundated
- Zero points if more than 15,000 acres would be inundated

Once the acres inundated score for the alternative was determined, a weighting factor of two was applied to that score (example: acres inundated score = 2×2 = a final score of four points).

Rating of Alternatives Based on Environmental Sensitivity

Rating of the environmental sensitivity of all alternatives was performed based on the criteria discussed above. Scores for all categories were calculated for each alternative and combined to obtain a total score ranging from 0 to 100 points. These scores are shown in Table 8. The environmental sensitivity scores for each alternative reservoir evaluated were plotted versus storage capacity. Curves were drawn through the discrete points associated

Table 8. Environmental Sensitivity Scores by Category

Alternative Offstream Reservoir	Main Dam Number	Dam Crest Elevation (feet)	Weighting Value						Weighted Total Environmental Sensitivity Rating (0 - 100)
			Wetlands 6	Vegetation 4	Wildlife 4	T&E Species 6	Habitat Diversity 3	Inundated Area 2	
Arroyo Ciervo 1	4	2,000	3	1	1	1	2	4	46
Arroyo Ciervo 2	4	1,800	3	1	1	1	2	4	46
Arroyo Hondo 1	7	2,000	2	2	1	1	2	3	42
Arroyo Hondo 2	7	1,920	2	2	1	1	2	3	42
Arroyo Hondo 3	14	1,600	2	2	1	1	2	3	42
Arroyo Hondo 4	14	1,520	2	2	1	1	2	3	42
Arroyo Hondo 5	7	1,800	2	2	1	1	2	3	42
Arroyo Hondo 6	7	1,600	2	2	1	1	2	4	44
Arroyo Hondo 7	14	1,400	2	2	1	1	2	4	44
Arroyo Hondo 8	11	1,000	2	2	1	1	2	4	44
Bitter Creek 1	16	1,750	3	2	1	1	3	4	53
Bitter Creek 2	17	3,000	3	2	1	1	3	4	53
Bitter Creek 3	123	2,250	3	2	1	1	3	4	53
Bitterwater Valley 1	18	1,700	2	2	1	1	2	3	42
Bitterwater Valley 2	128	1,600	2	2	1	1	2	4	44
Bitterwater Valley 3	128	1,500	2	2	1	1	2	4	44
Broad Creek	98	800	3	3	1	1	3	4	57
Buena Vista Creek	97	800	3	3	1	1	3	4	57
Buena Vista Lake Bed	-	290	4	2	1	1	4	0	54
Cantua Creek 1	116	1,600	3	2	1	1	2	2	46
Cantua Creek 2	20	1,400	3	2	1	1	2	3	48
Cantua Creek 3	22	1,200	3	2	1	1	2	3	48
Cantua Creek 4	21	800	3	2	1	1	2	4	50
Cantua Creek 5	116	1,400	3	2	1	1	2	3	48
Cantua Creek 6	116	1,200	3	2	1	1	2	4	50
Cantua Creek 7	20	1,200	3	2	1	1	2	4	50
Capita Canyon	42	1,400	3	2	1	1	2	4	50
Castac Valley 1	47	4,000	1	1	1	1	1	3	29
Castac Valley 2	117	3,250	1	1	1	1	1	3	29
Castac Valley 3	117	3,000	1	1	1	1	1	4	31
Castac Valley 4	117	2,750	1	1	1	1	1	4	31
Castac Valley 5	117	2,500	1	1	1	1	1	4	31
Deep Gulch	28	800	3	3	1	1	3	4	57
Del Puerto Canyon 1	191	460	3	2	1	1	3	4	53
Del Puerto Canyon 2	193	600	3	2	1	1	3	4	53
Del Puerto Canyon 3	194	720	3	2	1	1	3	4	53
Del Puerto Canyon 4	193	500	3	2	1	1	3	4	53
Del Puerto Canyon 5	194	600	3	2	1	1	3	4	53

Table 8. Environmental Sensitivity Scores by Category

Alternative Offstream Reservoir	Main Dam Number	Dam Crest Elevation (feet)	Weighting Value						Weighted Total Environmental Sensitivity Rating (0 - 100)
			Wetlands	Vegetation	Wildlife	T&E Species	Habitat Diversity	Inundated Area	
Garzas Creek 1	104	1,200	3	2	1	2	2	2	52
Garzas Creek 2	105	1,000	3	2	1	2	2	3	54
Garzas Creek 3	106	700	3	2	1	2	2	3	54
Garzas Creek 4	107	600	3	2	1	2	2	3	54
Garzas Creek 5	108	800	3	2	1	2	2	3	54
Garzas Creek 6	109	1,000	3	2	1	2	2	2	52
Garzas Creek 7	108	720	3	2	1	2	2	3	54
Garzas Creek 8	108	600	3	2	1	2	2	4	56
Garzas Creek 9	109	920	3	2	1	2	2	3	54
Garzas Creek 10	109	800	3	2	1	2	2	3	54
Garzas Creek 11	109	720	3	2	1	2	2	4	56
Garzas Creek 12	105	920	3	2	1	2	2	3	54
Garzas Creek 13	105	880	3	2	1	2	2	3	54
Garzas Creek 14	106	600	3	2	1	2	2	4	56
Garzas Creek 15	106	640	3	2	1	2	2	3	54
Garzas Creek 16	107	400	3	2	1	2	2	4	56
Garzas Creek 17	107	480	3	2	1	2	2	4	56
Garzas Creek 18	104	1,120	3	2	1	2	2	2	52
Garzas Creek 19	104	1,000	3	2	1	2	2	3	54
Garzas Creek 20	104	920	3	2	1	2	2	3	54
Garzas Creek 21	104	800	3	2	1	2	2	4	56
Garzas Creek 22	104	720	3	2	1	2	2	4	56
Garzas Creek 23	104	740	3	2	1	2	2	4	56
Garzas Creek 24	106	540	3	2	1	2	2	4	56
Garzas Creek 25	108	540	3	2	1	2	2	4	56
Hospital Creek 1	35	1,000	3	3	1	1	2	3	52
Hospital Creek 2	124	1,520	3	3	1	1	2	3	52
Hospital Creek 3	126	1,800	3	3	1	1	2	3	52
Hospital Creek 4	127	1,200	3	3	1	1	2	3	52
Hospital Creek 5	36	600	3	3	1	1	2	4	54
Hospital Creek 6	36	800	3	3	1	1	2	4	54
Ingram Canyon 1	37	1,200	2	2	1	2	2	3	48
Ingram Canyon 2	37	1,000	2	2	1	2	2	3	48
Ingram Canyon 3	37	800	2	2	1	2	2	4	50
Ingram/Kern Canyon	37	1,200	2	2	1	2	2	2	46
Kern Canyon	40	1,200	3	2	1	2	2	4	56
Kettleman Plain 1	99	500	4	3	1	1	3	2	59
Kettleman Plain 2	99	475	4	3	1	1	3	2	59
Kettleman Plain 3	99	490	4	3	1	1	3	2	59
Kettleman Plain 4	99	465	4	3	1	1	3	3	61

Table 8, Page 2

Table 8. Environmental Sensitivity Scores by Category

Alternative Offstream Reservoir	Main Dam Number	Dam Crest Elevation (feet)	Weighting Value						Weighted Total Environmental Sensitivity Rating (0 - 100)
			Wetlands 6	Vegetation 4	Wildlife 4	T&E Species 6	Habitat Diversity 3	Inundated Area 2	
Laguna Seca Creek 1	70	1,000	2	2	1	1	3	3	45
Laguna Seca Creek 2	131	900	2	2	1	1	3	4	47
Laguna Seca Creek 3	73	800	2	2	1	1	3	4	47
Laguna Seca Creek 4	72	600	2	2	1	1	3	4	47
Little Panoche Creek 1	76	900	2	2	2	1	2	3	46
Little Panoche Creek 2	146	800	2	2	2	1	2	4	48
Little Salado/Crow Creek 1	63	400	3	2	1	1	2	3	48
Little Salado/Crow Creek 2	67	800	3	2	1	1	2	3	48
Little Salado/Crow Creek 3	63	360	3	2	1	1	2	4	50
Little Salado/Crow Creek 4	63	340	3	2	1	1	2	4	50
Lone Tree Creek 1	30	880	3	2	1	1	2	4	50
Lone Tree Creek 2	139	1,400	3	2	1	1	2	3	48
Lone Tree Creek 3	139	1,200	3	2	1	1	2	4	50
Lone Tree Creek 4	33	800	3	2	1	1	2	4	50
Lone Tree Creek 5	32	600	3	2	1	1	2	4	50
Los Banos Creek 1	181	800	2	1	1	1	1	1	31
Los Banos Creek 2	181	720	2	1	1	1	1	2	33
Los Banos Creek 3	181	640	2	1	1	1	1	3	35
Los Banos Creek 4	181	600	2	1	1	1	1	4	37
Los Banos Creek 5	181	520	2	1	1	1	1	1	31
Los Gatos Creek 1	26	1,800	2	2	1	1	2	1	38
Los Gatos Creek 2	100	1,560	2	2	1	1	2	2	40
Los Gatos Creek 3	102	1,400	2	2	1	1	2	4	44
Los Gatos Creek 4	103	1,400	2	2	1	1	2	3	42
Los Gatos Creek 5	27	1,000	2	2	1	1	2	4	44
McKittrick Valley	93	1,000	3	2	1	1	3	3	51
Moreno Gulch 1	43	1,800	3	3	1	1	3	3	55
Moreno Gulch 2	121	1,600	3	3	1	1	3	4	57
Moreno Gulch 3	121	1,400	3	3	1	1	3	4	57
Moreno Gulch 4	44	1,200	3	3	1	1	3	4	57
Mustang Creek	50	700	3	2	1	1	2	4	50
Orestimba Creek 1	171	800	2	2	1	2	2	2	46
Orestimba Creek 2	171	600	2	2	1	2	2	3	48
Orestimba Creek 3	170	1,000	2	2	1	2	2	2	46
Orestimba Creek 4	170	800	2	2	1	2	2	4	50
Orestimba Creek 5	170	600	2	2	1	2	2	4	50
Orestimba Creek 6	171	400	2	2	1	2	2	4	50
Ortigalita Creek	176	800	1	2	1	1	2	3	36
Oso Creek 1	138	800	2	2	1	1	2	4	44
Oso Creek 2	160	800	2	2	1	1	2	4	44

Table 8, Page 3

Table 8. Environmental Sensitivity Scores by Category

Alternative Offstream Reservoir	Main Dam Number	Dam Crest Elevation (feet)	Weighting Value						Weighted Total Environmental Sensitivity Rating (0 - 100)
			Wetlands	Vegetation	Wildlife	Species	Habitat Diversity	Inundated Area	
6	4	4	6	3	2				
Packwood Creek 1	79	1,200	3	2	1	1	3	3	51
Packwood Creek 2	130	1,100	3	2	1	1	3	4	53
Panoche Hills	132	1,100	3	2	1	1	3	4	53
Panoche/Silver Creek 1	45	1,200	3	3	2	1	3	2	57
Panoche/Silver Creek 2	111	800	2	3	1	1	3	3	49
Panoche/Silver Creek 3	112	1,000	2	3	1	1	3	2	47
Panoche/Silver Creek 4	113	1,200	3	3	2	1	3	2	57
Panoche/Silver Creek 5	114	1,200	2	3	1	1	3	0	43
Panoche/Silver Creek 6	111	720	2	3	1	1	3	4	51
Panoche/Silver Creek 7	111	760	2	3	1	1	3	3	49
Panoche/Silver Creek 8	112	800	2	3	1	1	3	3	49
Panoche/Silver Creek 9	112	880	2	3	1	1	3	3	49
Panoche/Silver Creek 10	45	1,120	3	3	2	1	3	3	59
Panoche/Silver Creek 11	45	1,000	3	3	2	1	3	3	59
Panoche/Silver Creek 12	45	800	3	3	2	1	3	4	61
Panoche/Silver Creek 13	113	1,120	3	3	2	1	3	3	59
Panoche/Silver Creek 14	113	1,000	3	3	2	1	3	4	61
Panoche/Silver Creek 15	114	1,120	2	3	1	1	3	1	45
Panoche/Silver Creek 16	114	1,000	2	3	1	1	3	2	47
Panoche/Silver Creek 17	114	800	2	3	1	1	3	3	49
Panoche/Silver Creek 18	114	720	2	3	1	1	3	4	51
Panoche/Silver Creek 19	112	700	2	3	1	1	3	4	51
Pleito Creek 1	86	3,000	3	1	1	1	2	4	46
Pleito Creek 2	118	3,750	3	1	1	1	2	2	42
Pleito Creek 3	118	3,500	3	1	1	1	2	3	44
Pleito Creek 4	118	3,250	3	1	1	1	2	3	44
Pleito Creek 5	118	3,000	3	1	1	1	2	4	46
Pleito Creek 6	118	2,750	3	1	1	1	2	4	46
Quinto Creek 1	54	600	3	2	1	1	2	3	48
Quinto Creek 2	101	800	3	2	1	1	2	3	48
Quinto Creek 3	54	500	3	2	1	1	2	4	50
Romero Creek 1	56	600	3	2	1	1	3	4	53
Romero Creek 2	56	520	3	2	1	1	3	4	53
Salado Creek 1	62	900	3	2	1	1	3	4	53
Salado Creek 2	135	900	3	2	1	1	3	4	53
Salado Creek 3	137	1,200	3	2	1	1	3	3	51
Salado Creek 4	137	1,000	3	2	1	1	3	4	53
Salt Creek 1-Fresno Co.	24	1,400	3	2	1	1	2	3	48
Salt Creek 2-Fresno Co.	24	1,360	3	2	1	1	2	3	48
Salt Creek 3-Fresno Co.	24	1,200	3	2	1	1	2	4	50

Table 8, Page 4

Table 8. Environmental Sensitivity Scores by Category

Alternative Offstream Reservoir	Main Dam Number	Dam Crest Elevation (feet)	Weighting Value						Weighted Total Environmental Sensitivity Rating (0 - 100)
			Wetlands	Vegetation	Wildlife Species	T&E	Habitat Diversity	Inundated Area	
Salt Creek 1-Kern Co.	91	3,500	3	3	1	1	3	4	57
Salt Creek 2-Kern Co.	134	2,750	3	3	1	1	3	4	57
Salt Creek 3-Kern Co.	134	2,500	3	3	1	1	3	4	57
Salt Creek 1-Merced Co.	1	500	2	2	1	1	2	4	44
Salt Creek 2-Merced Co.	148	520	2	2	1	1	2	4	44
San Emigdio Creek 1	77	2,500	3	2	1	1	3	4	53
San Emigdio Creek 2	120	4,250	3	2	1	1	3	4	53
San Luis Creek 1	143	1,200	3	2	1	1	2	3	48
San Luis Creek 2	143	1,120	3	2	1	1	2	3	48
San Luis Creek 3	143	1,000	3	2	1	1	2	3	48
San Luis Creek 4	143	720	3	2	1	1	2	4	50
San Luis Creek 5	145	720	3	2	1	1	2	3	48
San Luis Creek 6	145	600	3	2	1	1	2	4	50
Sandy Creek	92	750	3	2	1	1	2	4	50
Santiago Creek 1	19	3,000	3	2	1	1	2	4	50
Santiago Creek 2	19	2,750	3	2	1	1	2	4	50
Sunflower Valley 1	177	700	3	2	1	1	2	1	44
Sunflower Valley 2	177	675	3	2	1	1	2	2	46
Sunflower Valley 3	177	650	3	2	1	1	2	2	46
Sunflower Valley 4	177	625	3	2	1	1	2	3	48
Wildcat Canyon	74	1,000	3	3	1	1	3	4	57

with each damsite to allow interpolation of the scores for the entire range of storage capacities available at each damsite. Figure 6 shows environmental sensitivity rating versus storage capacity for reservoirs with unit costs below \$3,000 per acre foot of storage.

Determination of Combined Scores

The last step in the Phase One evaluation process was to combine the cost and environmental sensitivity scores. These two scores were given equal weight in developing the combined score for each alternative. The combined scores had a possible range of 0 to 100 points. Table 9 shows these combined scores for all Phase One reservoir alternatives. As previously described, all reservoir alternatives with a capital cost per acre-foot of \$3,000 or more were disqualified prior to this step of the evaluation.

Figure 7 compares combined scores for all alternatives with storage capacities. Curves were drawn through the discrete points that represent the specific reservoir sizes evaluated for each damsite to allow interpolation of combined score for the entire range of storage capacities available at each damsite. Figures 8a and 8b display this same information broken into the four reservoir size categories. Table 10 lists the ranges of reservoir sizes evaluated at each damsite within the four storage volume categories and the associated ranges of unit costs and scores.

Final Phase One Screening

Using the curves of combined score versus storage volume described above (Figures 8a and 8b), alternative damsites with the highest combined scores were selected for subsequent investigation for each storage volume category. Figures 9a and 9b display the same curves shown in Figures 8a and 8b, with selected alternatives depicted with bold lines and unselected alternatives shown with dashed lines. As shown in these figures, 10 small, 10 medium, 10 large, and 4 very large damsites were selected for subsequent investigation. These quantities of alternatives were selected for each size category to provide a reasonable variety of alternatives for subsequent investigation. A higher number of alternatives were selected for the small, medium, and large categories because: (1) there are more potential

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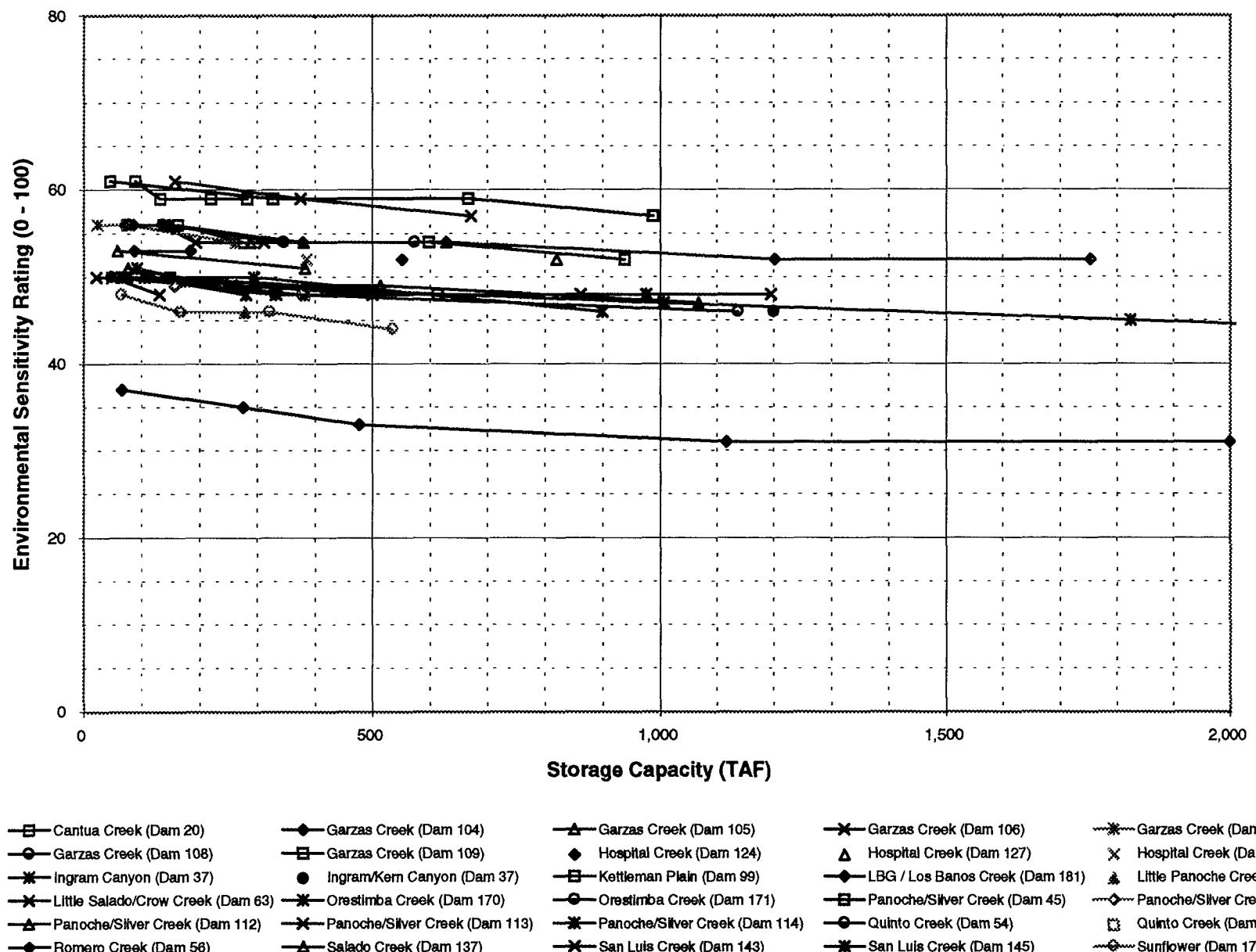
Figure 6. Environmental Sensitivity Rating versus Storage Capacity

Table 9. Rating of Alternatives

Alternative Offstream Reservoir	Main Dam Number	Normal Pool Storage Capacity (TAF)	Cost Rating 100: \$0/AF 0: \$3,000/AF (0-100)	Environmental Sensitivity Rating (0-100)	Combined Total Rating Cost: 50% Environmental: 50% (0-100)
Arroyo Cielvo 1	4	278	Disqualified	46	Disqualified
Arroyo Cielvo 2	4	105	Disqualified	46	Disqualified
Arroyo Hondo 1	7	896	Disqualified	42	Disqualified
Arroyo Hondo 2	7	641	Disqualified	42	Disqualified
Arroyo Hondo 5	7	356	Disqualified	42	Disqualified
Arroyo Hondo 6	7	100	Disqualified	44	Disqualified
Arroyo Hondo 3	14	674	Disqualified	42	Disqualified
Arroyo Hondo 4	14	456	Disqualified	42	Disqualified
Arroyo Hondo 7	14	232	Disqualified	44	Disqualified
Arroyo Hondo 8	11	75	Disqualified	44	Disqualified
Bitter Creek 1	16	192	Disqualified	53	Disqualified
Bitter Creek 2	17	462	Disqualified	53	Disqualified
Bitter Creek 3	123	101	Disqualified	53	Disqualified
Bitterwater Valley 1	18	396	Disqualified	42	Disqualified
Bitterwater Valley 2	128	145	Disqualified	44	Disqualified
Bitterwater Valley 3	128	40	Disqualified	44	Disqualified
Broad Creek	98	31	Disqualified	57	Disqualified
Buena Vista Creek	97	59	Disqualified	57	Disqualified
Buena Vista Lake Bed	-	91	Disqualified	54	Disqualified
Cantua Creek 1	116	1,327	Disqualified	46	Disqualified
Cantua Creek 5	116	513	Disqualified	48	Disqualified
Cantua Creek 6	116	117	Disqualified	50	Disqualified
Cantua Creek 2	20	614	8	48	28
Cantua Creek 7	20	150	Disqualified	50	Disqualified
Cantua Creek 3	22	249	Disqualified	48	Disqualified
Cantua Creek 4	21	82	Disqualified	50	Disqualified
Capita Canyon	42	27	Disqualified	50	Disqualified
Castac Valley 1	47	826	Disqualified	29	Disqualified
Castac Valley 2	117	1,206	Disqualified	29	Disqualified
Castac Valley 3	117	641	Disqualified	31	Disqualified
Castac Valley 4	117	317	Disqualified	31	Disqualified
Castac Valley 5	117	135	Disqualified	31	Disqualified
Deep Gulch	28	58	Disqualified	57	Disqualified
Del Puerto Canyon 1	191	88	16	53	34
Del Puerto Canyon 2	193	94	Disqualified	53	Disqualified
Del Puerto Canyon 4	193	35	Disqualified	53	Disqualified
Del Puerto Canyon 3	194	191	Disqualified	53	Disqualified
Del Puerto Canyon 5	194	71	Disqualified	53	Disqualified

Table 9, Page 1

Table 9. Rating of Alternatives

Alternative Offstream Reservoir	Main Dam Number	Normal Pool Storage Capacity (TAF)	Cost Rating 100: \$0/AF 0: \$3,000/AF (0-100)	Environmental Sensitivity Rating (0-100)	Combined Total Rating Cost: 50% Environmental: 50% (0-100)
Garzas Creek 1	104	1,754	56	52	54
Garzas Creek 18	104	1,202	52	52	52
Garzas Creek 19	104	628	37	54	46
Garzas Creek 20	104	379	24	54	39
Garzas Creek 21	104	149	Disqualified	56	Disqualified
Garzas Creek 22	104	72	Disqualified	56	Disqualified
Garzas Creek 23	104	86	Disqualified	56	Disqualified
Garzas Creek 2	105	628	45	54	49
Garzas Creek 12	105	380	29	54	41
Garzas Creek 13	105	289	20	54	37
Garzas Creek 3	106	312	39	54	47
Garzas Creek 14	106	139	13	56	35
Garzas Creek 15	106	194	25	54	39
Garzas Creek 24	106	79	Disqualified	56	Disqualified
Garzas Creek 4	107	262	36	54	45
Garzas Creek 16	107	24	Disqualified	56	Disqualified
Garzas Creek 17	107	75	Disqualified	56	Disqualified
Garzas Creek 5	108	574	30	54	42
Garzas Creek 7	108	346	16	54	35
Garzas Creek 8	108	138	Disqualified	56	Disqualified
Garzas Creek 25	108	79	Disqualified	56	Disqualified
Garzas Creek 6	109	939	42	52	47
Garzas Creek 9	109	599	31	54	43
Garzas Creek 10	109	277	12	54	33
Garzas Creek 11	109	163	Disqualified	56	Disqualified
Hospital Creek 1	35	385	3	52	27
Hospital Creek 2	124	552	3	52	27
Hospital Creek 3	126	1,155	Disqualified	52	Disqualified
Hospital Creek 4	127	820	12	52	32
Hospital Creek 5	36	18	Disqualified	54	Disqualified
Hospital Creek 6	36	152	Disqualified	54	Disqualified
Ingram Canyon 1	37	977	53	48	51
Ingram Canyon 2	37	333	29	48	38
Ingram Canyon 3	37	67	Disqualified	50	Disqualified
Ingram/Kern Canyon	37	1,201	25	46	36
Kern Canyon	40	223	Disqualified	56	Disqualified
Kettleman Plain 1	99	283	50	59	55
Kettleman Plain 2	99	133	20	59	39
Kettleman Plain 3	99	220	42	59	51
Kettleman Plain 4	99	89	Disqualified	61	Disqualified

Table 9, Page 2

Table 9. Rating of Alternatives

Alternative Offstream Reservoir	Main Dam Number	Normal Pool Storage Capacity (TAF)	Cost Rating 100: \$0/AF 0: \$3,000/AF (0-100)	Environmental Sensitivity Rating (0-100)	Combined Total Rating Cost: 50% Environmental: 50% (0-100)
Laguna Seca Creek 1	70	228	Disqualified	45	Disqualified
Laguna Seca Creek 2	131	85	Disqualified	47	Disqualified
Laguna Seca Creek 3	73	53	Disqualified	47	Disqualified
Laguna Seca Creek 4	72	24	Disqualified	47	Disqualified
Little Panoche Creek 1	76	279	17	46	32
Little Panoche Creek 2	146	107	Disqualified	48	Disqualified
Little Salado/Crow Creek 1	63	132	23	48	36
Little Salado/Crow Creek 3	63	49	Disqualified	50	Disqualified
Little Salado/Crow Creek 4	63	22	Disqualified	50	Disqualified
Little Salado/Crow Creek 2	67	250	Disqualified	48	Disqualified
Lone Tree Creek 1	30	53	Disqualified	50	Disqualified
Lone Tree Creek 2	139	432	Disqualified	48	Disqualified
Lone Tree Creek 3	139	155	Disqualified	50	Disqualified
Lone Tree Creek 4	33	63	Disqualified	50	Disqualified
Lone Tree Creek 5	32	19	Disqualified	50	Disqualified
Los Banos Creek 1	181	2,000	82	31	56
Los Banos Creek 2	181	1,117	78	31	54
Los Banos Creek 3	181	477	66	33	50
Los Banos Creek 4	181	276	54	35	45
Los Banos Creek 5	181	67	Disqualified	37	Disqualified
Los Gatos Creek 1	26	2,500	37	38	37
Los Gatos Creek 2	100	1,167	Disqualified	40	Disqualified
Los Gatos Creek 3	102	170	Disqualified	44	Disqualified
Los Gatos Creek 4	103	295	Disqualified	42	Disqualified
Los Gatos Creek 5	27	24	Disqualified	44	Disqualified
McKittrick Valley	93	89	Disqualified	51	Disqualified
Moreno Gulch 1	43	598	Disqualified	55	Disqualified
Moreno Gulch 2	121	265	Disqualified	57	Disqualified
Moreno Gulch 3	121	68	Disqualified	57	Disqualified
Moreno Gulch 4	44	36	Disqualified	57	Disqualified
Mustang Creek	50	60	Disqualified	50	Disqualified
Orestimba Creek 1	171	1,137	47	46	46
Orestimba Creek 2	171	378	34	48	41
Orestimba Creek 6	171	48	Disqualified	50	Disqualified
Orestimba Creek 3	170	900	53	46	50
Orestimba Creek 4	170	295	29	50	39
Orestimba Creek 5	170	75	Disqualified	50	Disqualified

Table 9, Page 3

Table 9. Rating of Alternatives

Alternative Offstream Reservoir	Main Dam Number	Normal Pool Storage Capacity (TAF)	Cost Rating 100: \$0/AF 0: \$3,000/AF (0-100)	Environmental Sensitivity Rating (0-100)	Combined Total Rating Cost: 50% Environmental: 50% (0-100)
Ortigalita Creek	176	100	Disqualified	36	Disqualified
Oso Creek 1	138	116	Disqualified	44	Disqualified
Oso Creek 2	160	83	Disqualified	44	Disqualified
Packwood Creek 1	79	277	Disqualified	51	Disqualified
Packwood Creek 2	130	92	Disqualified	53	Disqualified
Panoche Hills	132	85	Disqualified	53	Disqualified
Panoche/Silver Creek 1	45	989	36	57	47
Panoche/Silver Creek 10	45	667	33	59	46
Panoche/Silver Creek 11	45	328	14	59	36
Panoche/Silver Creek 12	45	46	Disqualified	61	Disqualified
Panoche/Silver Creek 2	111	242	33	49	41
Panoche/Silver Creek 6	111	91	Disqualified	51	Disqualified
Panoche/Silver Creek 7	111	158	16	49	32
Panoche/Silver Creek 3	112	1,068	57	47	52
Panoche/Silver Creek 9	112	514	47	49	48
Panoche/Silver Creek 17	112	244	31	49	40
Panoche/Silver Creek 19	112	77	Disqualified	51	Disqualified
Panoche/Silver Creek 4	113	672	26	57	41
Panoche/Silver Creek 13	113	375	3	59	31
Panoche/Silver Creek 14	113	158	Disqualified	61	Disqualified
Panoche/Silver Creek 5	114	2,647	62	43	52
Panoche/Silver Creek 8	114	265	31	49	40
Panoche/Silver Creek 15	114	1,825	59	45	52
Panoche/Silver Creek 16	114	1,006	55	47	51
Panoche/Silver Creek 18	114	92	Disqualified	51	Disqualified
Pleito Creek 1	86	783	Disqualified	46	Disqualified
Pleito Creek 2	118	2,447	Disqualified	42	Disqualified
Pleito Creek 3	118	1,357	Disqualified	44	Disqualified
Pleito Creek 4	118	662	Disqualified	44	Disqualified
Pleito Creek 5	118	284	Disqualified	46	Disqualified
Pleito Creek 6	118	104	Disqualified	46	Disqualified
Quinto Creek 1	54	332	36	48	42
Quinto Creek 3	54	113	Disqualified	50	Disqualified
Quinto Creek 2	101	381	25	48	37
Romero Creek 1	56	184	15	53	34
Romero Creek 2	56	88	Disqualified	53	Disqualified
Salado Creek 1	62	78	Disqualified	53	Disqualified
Salado Creek 2	135	147	Disqualified	53	Disqualified
Salado Creek 3	137	382	22	51	36
Salado Creek 4	137	58	Disqualified	53	Disqualified

Table 9, Page 4

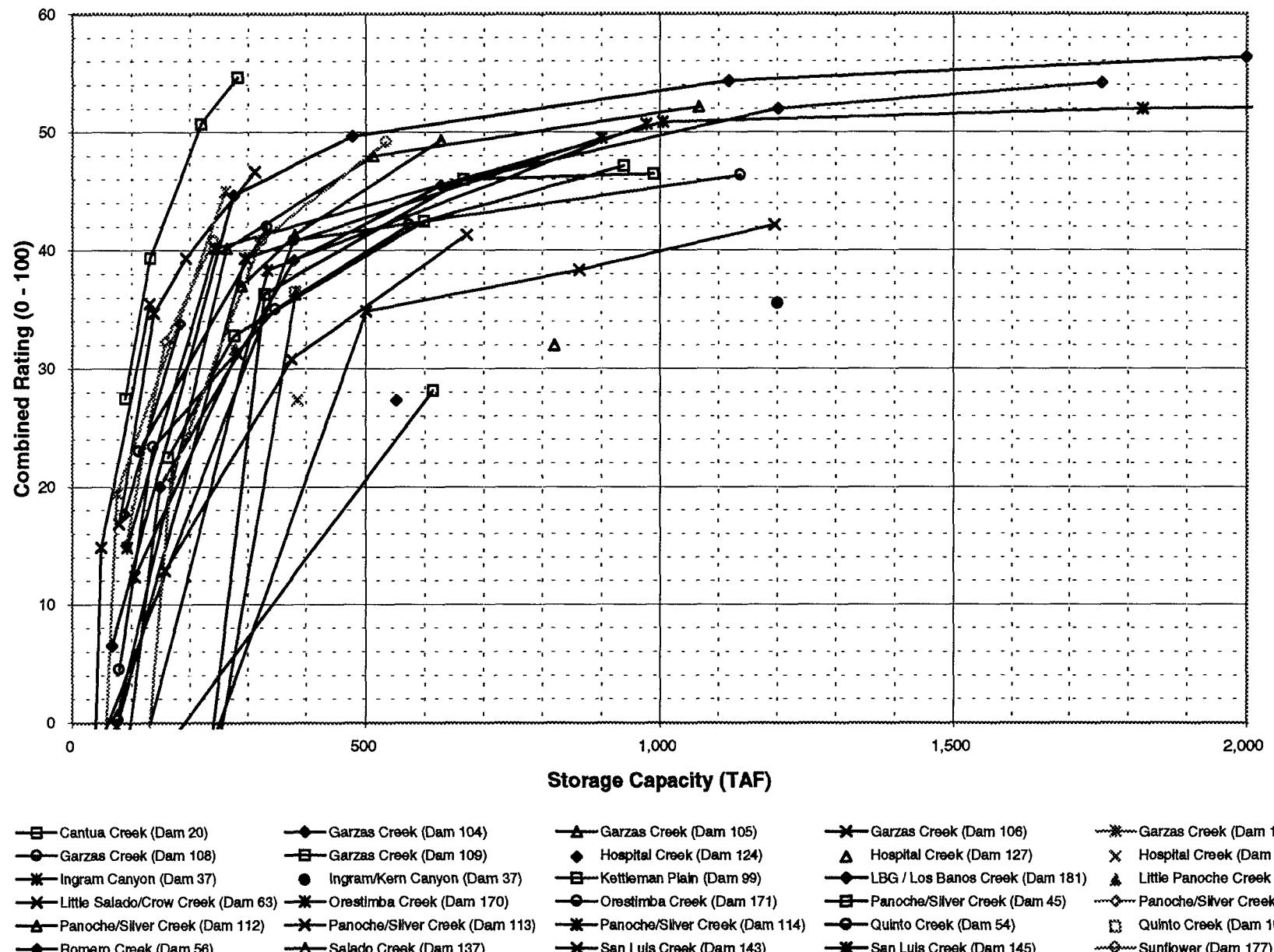
Table 9. Rating of Alternatives

Alternative Offstream Reservoir	Main Dam Number	Normal Pool Storage Capacity (TAF)	Cost Rating 100: \$0/AF 0: \$3,000/AF (0-100)	Environmental Sensitivity Rating (0-100)	Combined Total Rating Cost: 50% Environmental: 50% (0-100)
Salt Creek 1-Fresno Co.	24	380	Disqualified	48	Disqualified
Salt Creek 2-Fresno Co.	24	328	Disqualified	48	Disqualified
Salt Creek 3-Fresno Co.	24	117	Disqualified	50	Disqualified
Salt Creek 1-Kern Co.	91	283	Disqualified	57	Disqualified
Salt Creek 2-Kern Co.	134	323	Disqualified	57	Disqualified
Salt Creek 3-Kern Co.	134	105	Disqualified	57	Disqualified
Salt Creek 1-Merced Co.	1	61	Disqualified	44	Disqualified
Salt Creek 2-Merced Co.	148	72	Disqualified	44	Disqualified
San Emigdio Creek 1	77	101	Disqualified	53	Disqualified
San Emigdio Creek 2	120	757	Disqualified	53	Disqualified
San Luis Creek 1	143	1,196	36	48	42
San Luis Creek 2	143	862	29	48	38
San Luis Creek 3	143	501	22	48	35
San Luis Creek 4	143	70	Disqualified	50	Disqualified
San Luis Creek 5	145	282	15	48	31
San Luis Creek 6	145	106	Disqualified	50	Disqualified
Sandy Creek	92	50	Disqualified	50	Disqualified
Santiago Creek 1	19	459	Disqualified	50	Disqualified
Santiago Creek 2	19	147	Disqualified	50	Disqualified
Sunflower Valley 1	177	535	54	44	49
Sunflower Valley 2	177	322	36	46	41
Sunflower Valley 3	177	168	Disqualified	46	Disqualified
Sunflower Valley 4	177	66	Disqualified	48	Disqualified
Wildcat Canyon	74	79	Disqualified	57	Disqualified

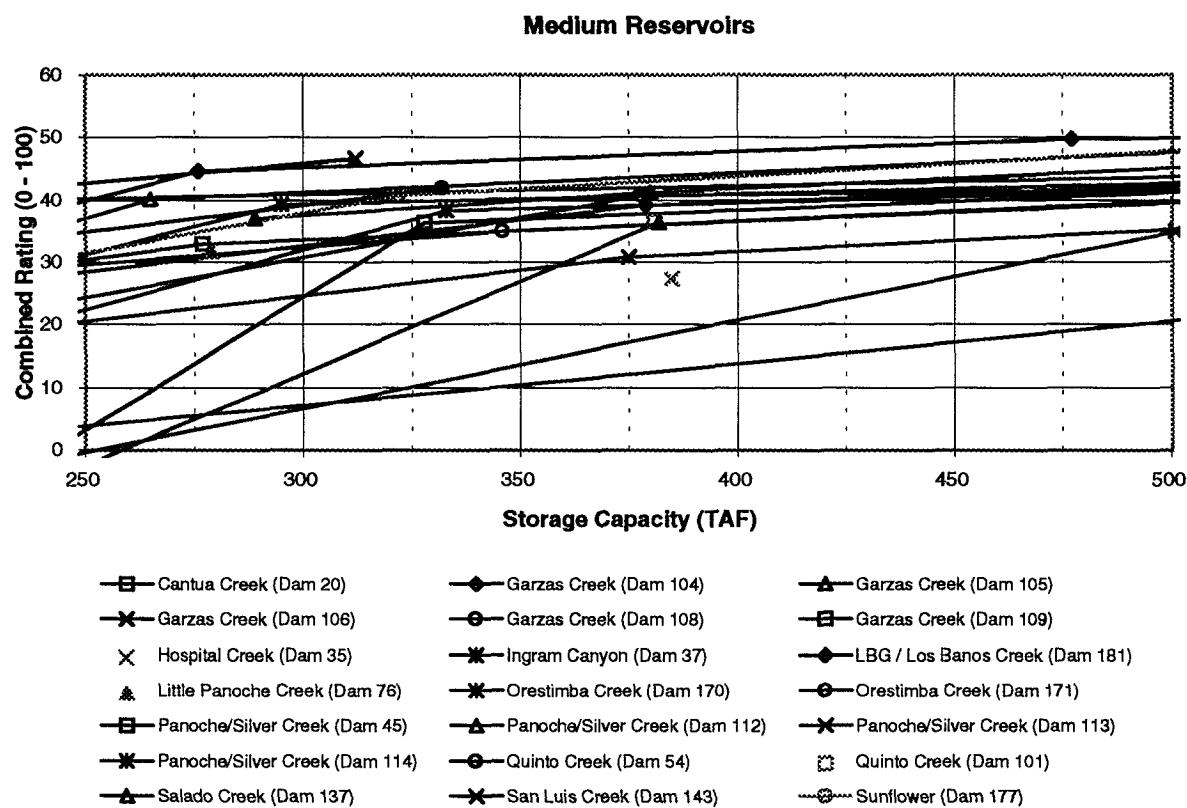
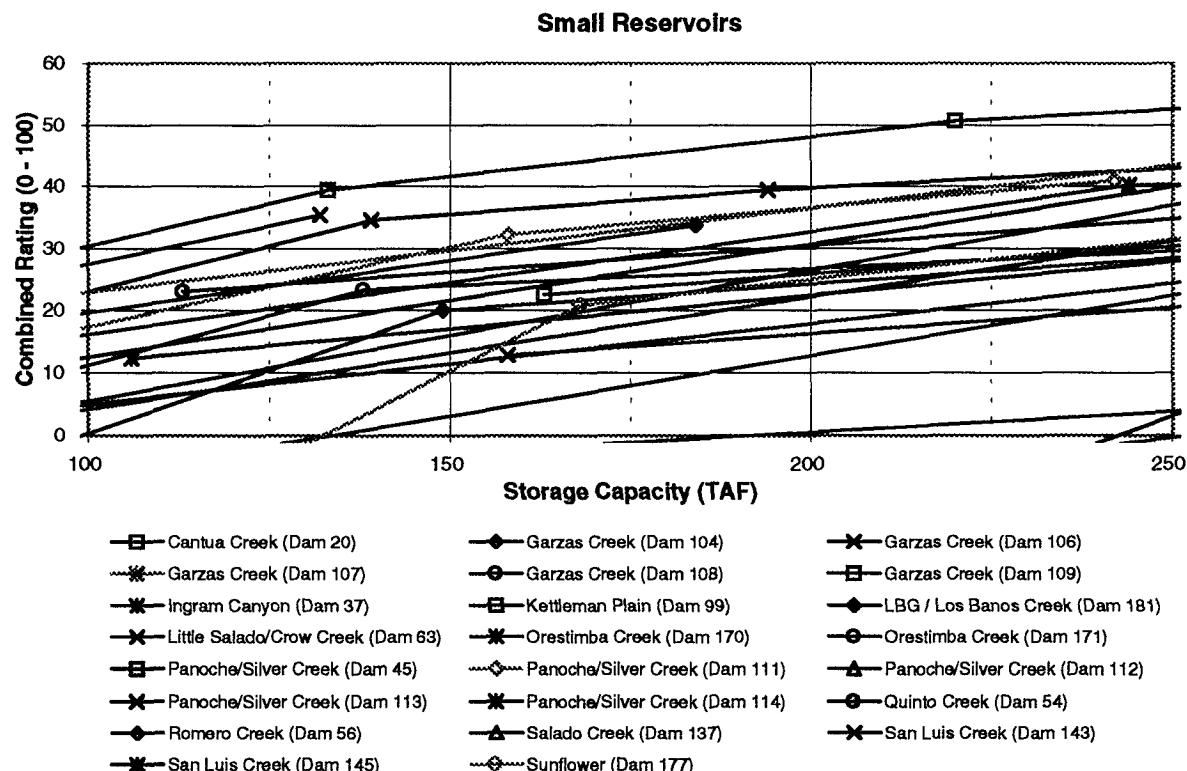
Table 9, Page 5

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Figure 7. Combined Scores versus Storage Volume



**Figure 8a. Combined Scores versus Storage Volume
Small and Medium Reservoirs**



**Figure 8b. Combined Scores versus Storage Volume
Large and Very Large Reservoirs**

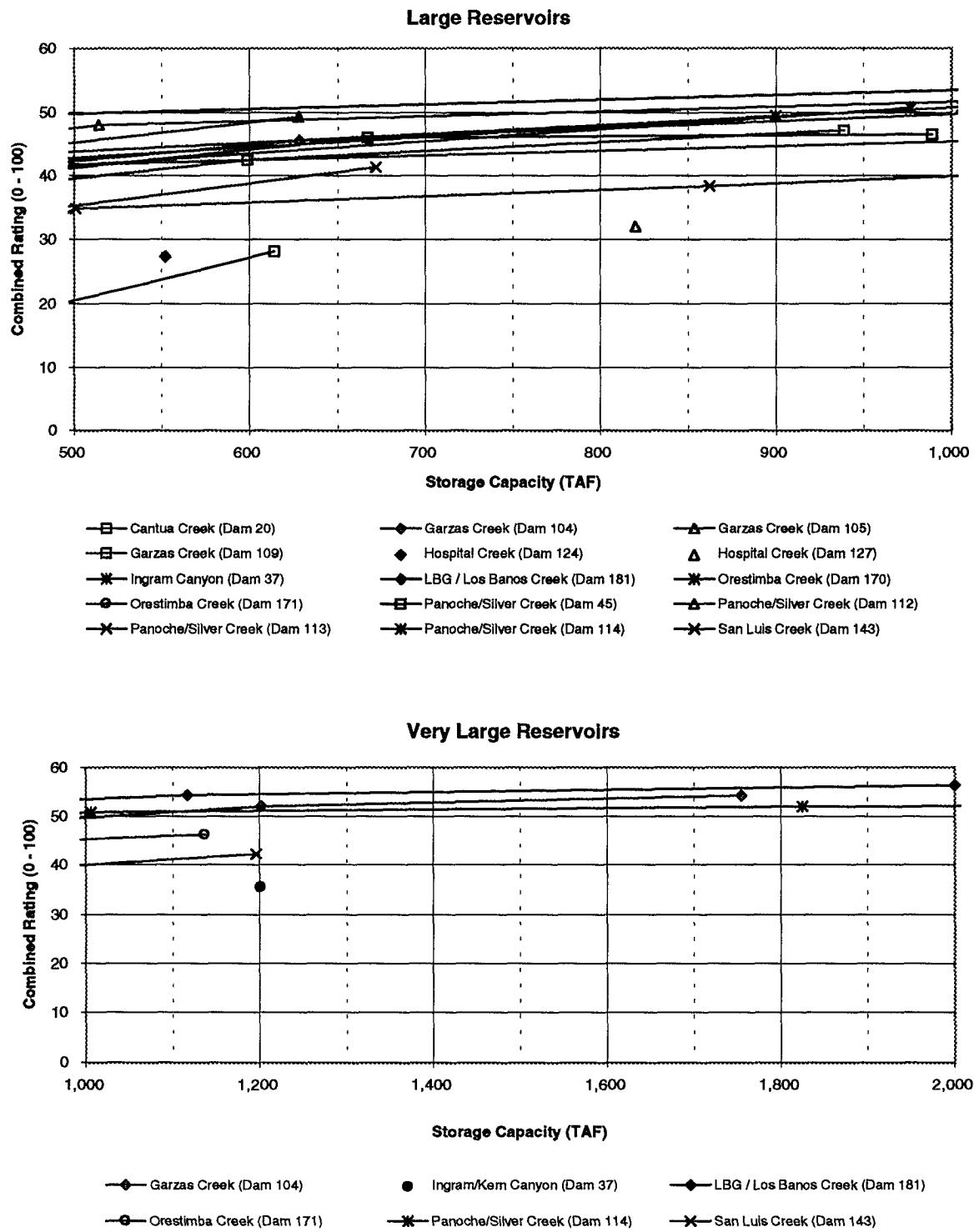


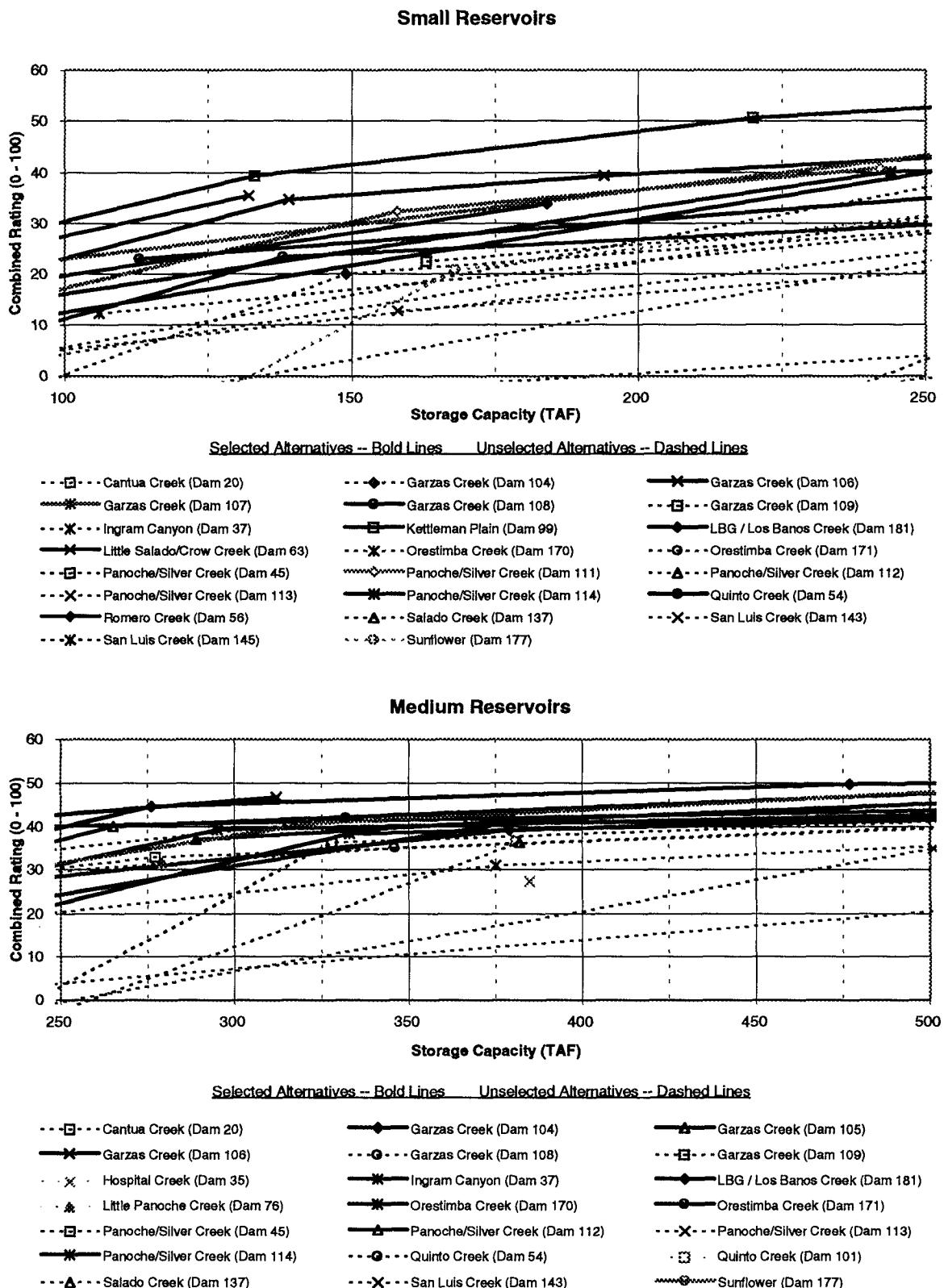
Table 10. Summary of Phase One Alternatives

Dam Site	Potential Range of Storage Volume (1,000 Acre-Feet)	Unit Cost of Storage (\$ per acre-foot)	Cost Rating (0 - 100)	Environmental Sensitivity Rating (0 - 100)	Combined Total Rating (0 - 100)
Very Large Reservoirs (1.0 to 2.0 MAF Storage Volume)					
Garzas Creek (Dam 104)	1,000 - 1,750	1,600 - 1,310	47 - 56	53 - 52	50 - 54
Ingram Canyon (Dam 37)	1,200 - 1,200	2,250 - 2,250	25 - 25	46 - 46	36 - 36
LBG / Los Banos Creek (Dam 181)	1,000 - 2,000	730 - 550	76 - 82	31 - 31	53 - 56
Orestimba Creek (Dam 171)	1,000 - 1,140	1,670 - 1,600	44 - 47	46 - 46	45 - 46
Panoche/Silver Creek (Dam 114)	1,000 - 2,000	1,370 - 1,210	54 - 60	47 - 45	51 - 52
San Luis Creek (Dam 143)	1,000 - 1,200	2,050 - 1,910	32 - 36	48 - 48	40 - 42
Large Reservoirs (0.5 to 1.0 MAF Storage Volume)					
Cantua Creek (Dam 20)	500 - 610	3,220 - 2,750	N/A - 8	N/A - 48	21 - 28
Garzas Creek (Dam 104)	500 - 1,000	2,090 - 1,600	30 - 47	54 - 53	42 - 50
Garzas Creek (Dam 105)	500 - 630	1,910 - 1,660	36 - 45	54 - 54	45 - 49
Garzas Creek (Dam 109)	500 - 940	2,250 - 1,730	25 - 42	54 - 52	40 - 47
Hospital Creek (Dam 124)	500 - 1,000	2,090 - 1,600	30 - 47	54 - 53	42 - 50
Hospital Creek (Dam 127)	820 - 820	2,640 - 2,640	12 - 12	52 - 52	32 - 32
Ingram Canyon (Dam 37)	500 - 980	1,950 - 1,400	35 - 53	48 - 48	42 - 51
LBG / Los Banos Creek (Dam 181)	500 - 1,000	1,000 - 730	67 - 76	33 - 31	50 - 53
Orestimba Creek (Dam 170)	500 - 900	1,890 - 1,410	37 - 53	49 - 46	43 - 50
Orestimba Creek (Dam 171)	500 - 1,000	1,930 - 1,670	36 - 44	48 - 46	42 - 45
Panoche/Silver Creek (Dam 112)	500 - 1,000	1,620 - 1,320	46 - 56	49 - 47	48 - 52
Panoche/Silver Creek (Dam 113)	500 - 670	2,630 - 2,230	12 - 26	58 - 57	35 - 41
Panoche/Silver Creek (Dam 114)	500 - 1,000	1,830 - 1,370	39 - 54	48 - 47	44 - 51
Panoche/Silver Creek (Dam 45)	500 - 990	2,300 - 1,920	23 - 36	59 - 57	41 - 47
San Luis Creek (Dam 143)	500 - 1,000	2,360 - 2,050	21 - 32	48 - 48	35 - 40
Medium Reservoirs (0.25 to 0.5 MAF Storage Volume)					
Cantua Creek (Dam 20)	250 - 500	4,260 - 3,220	N/A - N/A	50 - 48	N/A - N/A
Garzas Creek (Dam 104)	250 - 500	2,950 - 2,090	2 - 30	55 - 54	28 - 42
Garzas Creek (Dam 105)	290 - 500	2,400 - 1,910	20 - 36	54 - 54	37 - 45
Garzas Creek (Dam 106)	250 - 310	2,050 - 1,820	32 - 39	54 - 54	43 - 47
Garzas Creek (Dam 108)	250 - 500	2,870 - 2,230	4 - 26	55 - 54	30 - 40
Garzas Creek (Dam 109)	250 - 500	2,810 - 2,250	6 - 25	54 - 54	30 - 40
Hospital Creek (Dam 35)	390 - 390	2,920 - 2,920	3 - 3	52 - 52	27 - 27
Ingram Canyon (Dam 37)	250 - 500	3,120 - 1,950	N/A - 35	49 - 48	N/A - 42
LBG / Los Banos Creek (Dam 181)	250 - 500	1,660 - 1,000	45 - 67	35 - 33	40 - 50
Orestimba Creek (Dam 170)	250 - 500	2,630 - 1,890	12 - 37	50 - 49	31 - 43
Orestimba Creek (Dam 171)	250 - 500	3,000 - 1,930	0 - 36	49 - 48	24 - 42
Panoche/Silver Creek (Dam 112)	250 - 500	2,250 - 1,620	25 - 46	49 - 49	37 - 48
Panoche/Silver Creek (Dam 113)	250 - 500	3,580 - 2,630	N/A - 12	60 - 58	N/A - 35
Panoche/Silver Creek (Dam 114)	250 - 500	2,050 - 1,830	32 - 39	49 - 48	40 - 44
Panoche/Silver Creek (Dam 45)	250 - 500	4,600 - 2,300	N/A - 23	60 - 59	N/A - 41
Quinto Creek (Dam 101)	380 - 380	2,250 - 2,250	25 - 25	48 - 48	37 - 37
Salado Creek (Dam 137)	250 - 380	4,700 - 2,350	N/A - 22	52 - 51	N/A - 36
San Luis Creek (143)	250 - 500	4,500 - 2,360	N/A - 21	49 - 48	N/A - 35
Sunflower Valley (Dam 177)	250 - 500	2,490 - 1,460	17 - 51	46 - 44	31 - 48

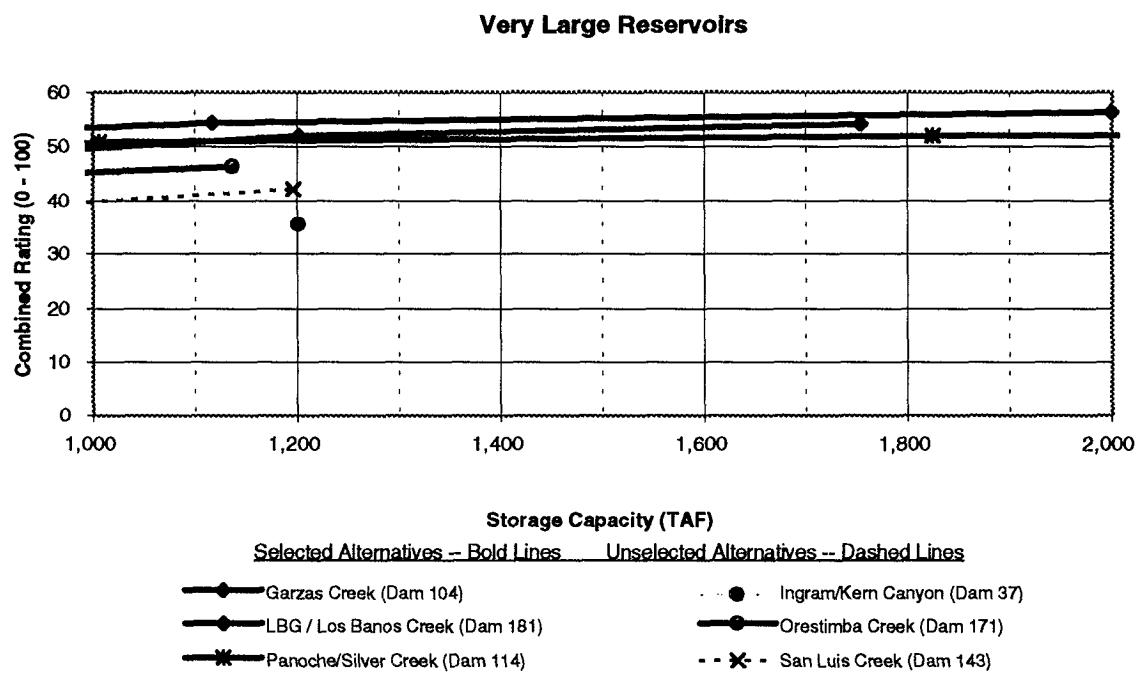
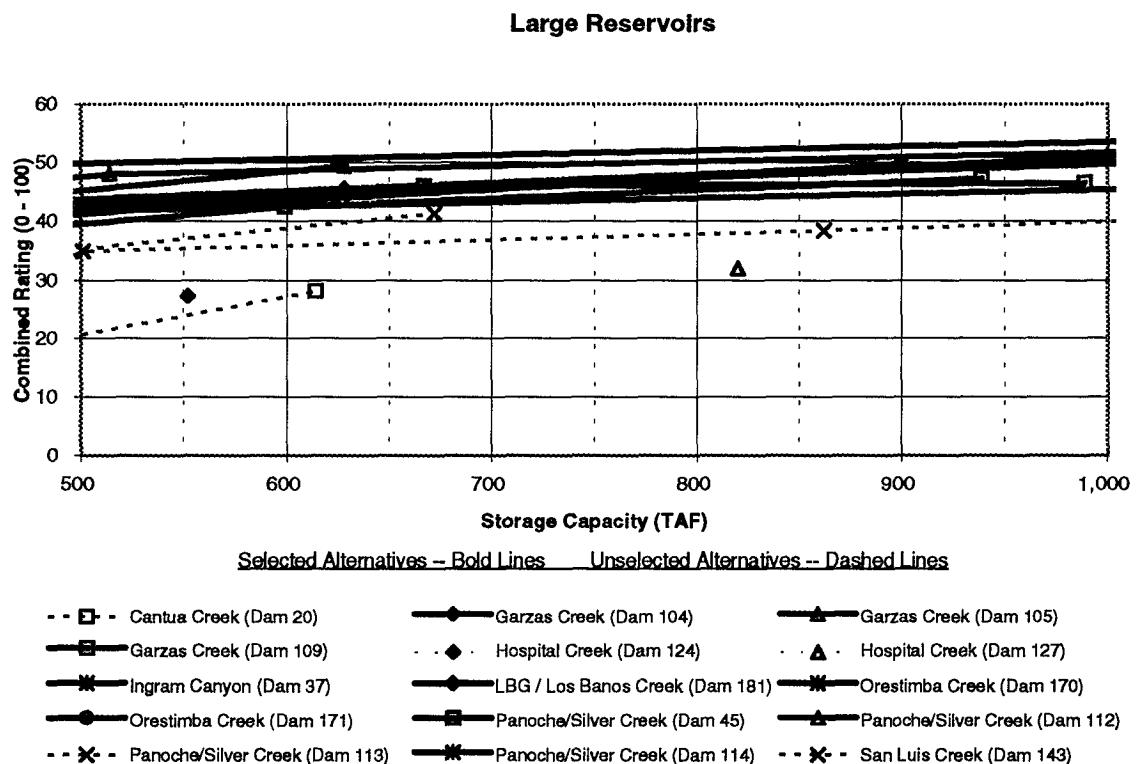
Table 10. Summary of Phase One Alternatives

Dam Site	Potential Range of Storage Volume (1,000 Acre-Feet)	Unit Cost of Storage (\$ per acre-foot)	Cost Rating (0 - 100)	Environmental Sensitivity Rating (0 - 100)	Combined Total Rating (0 - 100)
Small Reservoirs (0.10 to 0.25 MAF Storage Volume)					
Cantua Creek (Dam 20)	150 - 250	4,670 - 4,260	N/A - N/A	50 - 50	N/A - N/A
Del Puerto Canyon (Dam 191)	90 - 90	2,530 - 2,530	16 - 16	53 - 53	34 - 34
Garzas Creek (Dam 104)	100 - 250	4,660 - 2,950	N/A - 2	56 - 55	N/A - 28
Garzas Creek (Dam 106)	100 - 250	3,300 - 2,050	N/A - 32	56 - 54	N/A - 43
Garzas Creek (Dam 107)	100 - 250	3,300 - 2,020	N/A - 33	56 - 54	N/A - 43
Garzas Creek (Dam 108)	100 - 250	4,010 - 2,870	N/A - 4	56 - 55	N/A - 30
Garzas Creek (Dam 109)	160 - 250	3,330 - 2,810	N/A - 6	56 - 54	N/A - 30
Ingram Canyon (Dam 37)	100 - 250	4,880 - 3,120	N/A - N/A	50 - 49	N/A - N/A
Kettleman Plain (Dam 99)	100 - 250	2,990 - 1,620	0 - 46	61 - 59	30 - 53
LBG / Los Banos Creek (Dam 181)	100 - 250	3,350 - 1,660	N/A - 45	37 - 35	N/A - 40
Little Salado/Crow Creek (Dam 63)	100 - 130	2,810 - 2,310	6 - 23	49 - 48	28 - 36
Orestimba Creek (Dam 170)	100 - 250	4,250 - 2,630	N/A - 12	50 - 50	N/A - 31
Orestimba Creek (Dam 171)	100 - 250	4,190 - 3,000	N/A - 0	50 - 49	N/A - 24
Panoche/Silver Creek (Dam 111)	100 - 240	3,480 - 2,020	N/A - 33	51 - 49	N/A - 41
Panoche/Silver Creek (Dam 112)	100 - 250	4,190 - 2,250	N/A - 25	51 - 49	N/A - 37
Panoche/Silver Creek (Dam 113)	160 - 250	4,060 - 3,580	N/A - N/A	61 - 60	N/A - N/A
Panoche/Silver Creek (Dam 114)	100 - 250	3,560 - 2,050	N/A - 32	51 - 49	N/A - 40
Panoche/Silver Creek (Dam 45)	100 - 250	8,460 - 4,600	N/A - N/A	61 - 60	N/A - N/A
Quinto Creek (Dam 54)	110 - 250	3,120 - 2,370	N/A - 21	50 - 49	N/A - 35
Romero Creek (Dam 56)	100 - 180	3,410 - 2,560	N/A - 15	53 - 53	N/A - 34
Salado Creek (Dam 137)	100 - 250	7,370 - 4,700	N/A - N/A	53 - 52	N/A - N/A
San Luis Creek (Dam 143)	100 - 250	5,780 - 4,500	N/A - N/A	50 - 49	N/A - N/A
San Luis Creek (Dam 145)	110 - 250	3,760 - 2,780	N/A - 7	50 - 48	N/A - 28
Sunflower Valley (Dam 177)	100 - 250	5,560 - 2,490	N/A - 17	47 - 46	N/A - 31

**Figure 9a. Combined Scores versus Storage Volume
Selected Small and Medium Reservoirs**



**Figure 9b. Combined Scores versus Storage Volume
Selected Large and Very Large Reservoirs**



alternatives in these sizes, and (2) there is less variance among the combined scores for alternatives in these sizes.

After selecting alternatives for subsequent investigation based on combined scores, the individual cost and environmental sensitivity scores of the non-passing alternatives were revisited. This process provided assurance that no particularly strong, practicable alternative from either cost or environmental perspectives had been eliminated.

A composite total of 20 damsites located in 11 watersheds were retained for subsequent investigation (see Table 11). Because most of the selected damsites passed in more than one size category, the composite total of selected damsites is less than the sum of the damsites chosen for each size category. Summaries of the ranges of unit costs, cost ratings, environmental sensitivity ratings, and combined ratings for all selected alternative damsites in each size category are shown in Table 12. Locations of selected alternatives are shown in Figure 10.

Table 11. Selected Alternatives for Subsequent Investigation

Watershed Count	Dam Count	Dam Site	Reservoir Size Category			
			Small	Medium	Large	Very Large
1	1	Garzas Creek (Dam 104)		X	X	X
1	2	Garzas Creek (Dam 105)		X	X	
1	3	Garzas Creek (Dam 106)	X	X		
1	4	Garzas Creek (Dam 107)	X			
1	5	Garzas Creek (Dam 108)	X			
1	6	Garzas Creek (Dam 109)			X	
2	7	Ingram Canyon (Dam 37)		X	X	
3	8	Kettleman Plain (Dam 99)	X			
4	9	LBG / Los Banos Creek (Dam 181)	X	X	X	X
5	10	Little Salado/Crow Creek (Dam 63)	X			
6	11	Orestimba Creek (Dam 170)		X	X	
6	12	Orestimba Creek (Dam 171)		X	X	X
7	13	Panoche/Silver Creek (Dam 111)	X			
7	14	Panoche/Silver Creek (Dam 112)		X	X	
7	15	Panoche/Silver Creek (Dam 114)	X	X	X	X
7	16	Panoche/Silver Creek (Dam 45)			X	
8	17	Quinto Creek (Dam 54)	X			
9	18	Romero Creek (Dam 56)	X			
10	19	Sunflower Valley (Dam 177)			X	

Table 12. Summary of Phase One Passing Alternatives

Dam Site	Potential Range of Storage Volume (1,000 Acre-Feet)	Unit Cost of Storage (\$ per acre-foot)	Cost Rating (0 - 100)	Environmental Sensitivity Rating (0 - 100)	Combined Total Rating (0 - 100)
Very Large Reservoirs (1.0 to 2.0 MAF Storage Volume)					
Garzas Creek (Dam 104)	1,000 - 1,750	1,600 - 1,310	47 - 56	53 - 52	50 - 54
LBG / Los Banos Creek (Dam 181)	1,000 - 2,000	730 - 550	76 - 82	31 - 31	53 - 56
Orestimba Creek (Dam 171)	1,000 - 1,140	1,670 - 1,600	44 - 47	46 - 46	45 - 46
Panoche/Silver Creek (Dam 114)	1,000 - 2,000	1,370 - 1,210	54 - 60	47 - 45	51 - 52
Large Reservoirs (0.5 to 1.0 MAF Storage Volume)					
Garzas Creek (Dam 104)	500 - 1,000	2,090 - 1,600	30 - 47	54 - 53	42 - 50
Garzas Creek (Dam 105)	500 - 630	1,910 - 1,660	36 - 45	54 - 54	45 - 49
Garzas Creek (Dam 109)	500 - 940	2,250 - 1,730	25 - 42	54 - 52	40 - 47
Ingram Canyon (Dam 37)	500 - 980	1,950 - 1,400	35 - 53	48 - 48	42 - 51
LBG / Los Banos Creek (Dam 181)	500 - 1,000	1,000 - 730	67 - 76	33 - 31	50 - 53
Orestimba Creek (Dam 170)	500 - 900	1,890 - 1,410	37 - 53	49 - 46	43 - 50
Orestimba Creek (Dam 171)	500 - 1,000	1,930 - 1,670	36 - 44	48 - 46	42 - 45
Panoche/Silver Creek (Dam 112)	500 - 1,000	1,620 - 1,320	46 - 56	49 - 47	48 - 52
Panoche/Silver Creek (Dam 114)	500 - 1,000	1,830 - 1,370	39 - 54	48 - 47	44 - 51
Panoche/Silver Creek (Dam 45)	500 - 990	2,300 - 1,920	23 - 36	59 - 57	41 - 47
Medium Reservoirs (0.25 to 0.5 MAF Storage Volume)					
Garzas Creek (Dam 104)	250 - 500	2,950 - 2,090	2 - 30	55 - 54	28 - 42
Garzas Creek (Dam 105)	290 - 500	2,400 - 1,910	20 - 36	54 - 54	37 - 45
Garzas Creek (Dam 106)	250 - 310	2,050 - 1,820	32 - 39	54 - 54	43 - 47
Ingram Canyon (Dam 37)	250 - 500	3,120 - 1,950	N/A - 35	49 - 48	N/A - 42
LBG / Los Banos Creek (Dam 181)	250 - 500	1,660 - 1,000	45 - 67	35 - 33	40 - 50
Orestimba Creek (Dam 170)	250 - 500	2,630 - 1,890	12 - 37	50 - 49	31 - 43
Orestimba Creek (Dam 171)	250 - 500	3,000 - 1,930	0 - 36	49 - 48	24 - 42
Panoche/Silver Creek (Dam 112)	250 - 500	2,250 - 1,620	25 - 46	49 - 49	37 - 48
Panoche/Silver Creek (Dam 114)	250 - 500	2,050 - 1,830	32 - 39	49 - 48	40 - 44
Sunflower Valley (Dam 177)	250 - 500	2,490 - 1,460	17 - 51	46 - 44	31 - 48
Small Reservoirs (0.10 to 0.25 MAF Storage Volume)					
Garzas Creek (Dam 106)	100 - 250	3,300 - 2,050	N/A - 32	56 - 54	N/A - 43
Garzas Creek (Dam 107)	100 - 250	3,300 - 2,020	N/A - 33	56 - 54	N/A - 43
Garzas Creek (Dam 108)	100 - 250	4,010 - 2,870	N/A - 4	56 - 55	N/A - 30
Kettleman Plain (Dam 99)	100 - 250	2,990 - 1,620	0 - 46	61 - 59	30 - 53
LBG / Los Banos Creek (Dam 181)	100 - 250	3,350 - 1,660	N/A - 45	37 - 35	N/A - 40
Little Salado/Crow Creek (Dam 63)	100 - 130	2,810 - 2,310	6 - 23	49 - 48	28 - 36
Panoche/Silver Creek (Dam 111)	100 - 240	3,480 - 2,020	N/A - 33	51 - 49	N/A - 41
Panoche/Silver Creek (Dam 114)	100 - 250	3,560 - 2,050	N/A - 32	51 - 49	N/A - 40
Quinto Creek (Dam 54)	110 - 250	3,120 - 2,370	N/A - 21	50 - 49	N/A - 35
Romero Creek (Dam 56)	100 - 180	3,410 - 2,560	N/A - 15	53 - 53	N/A - 34

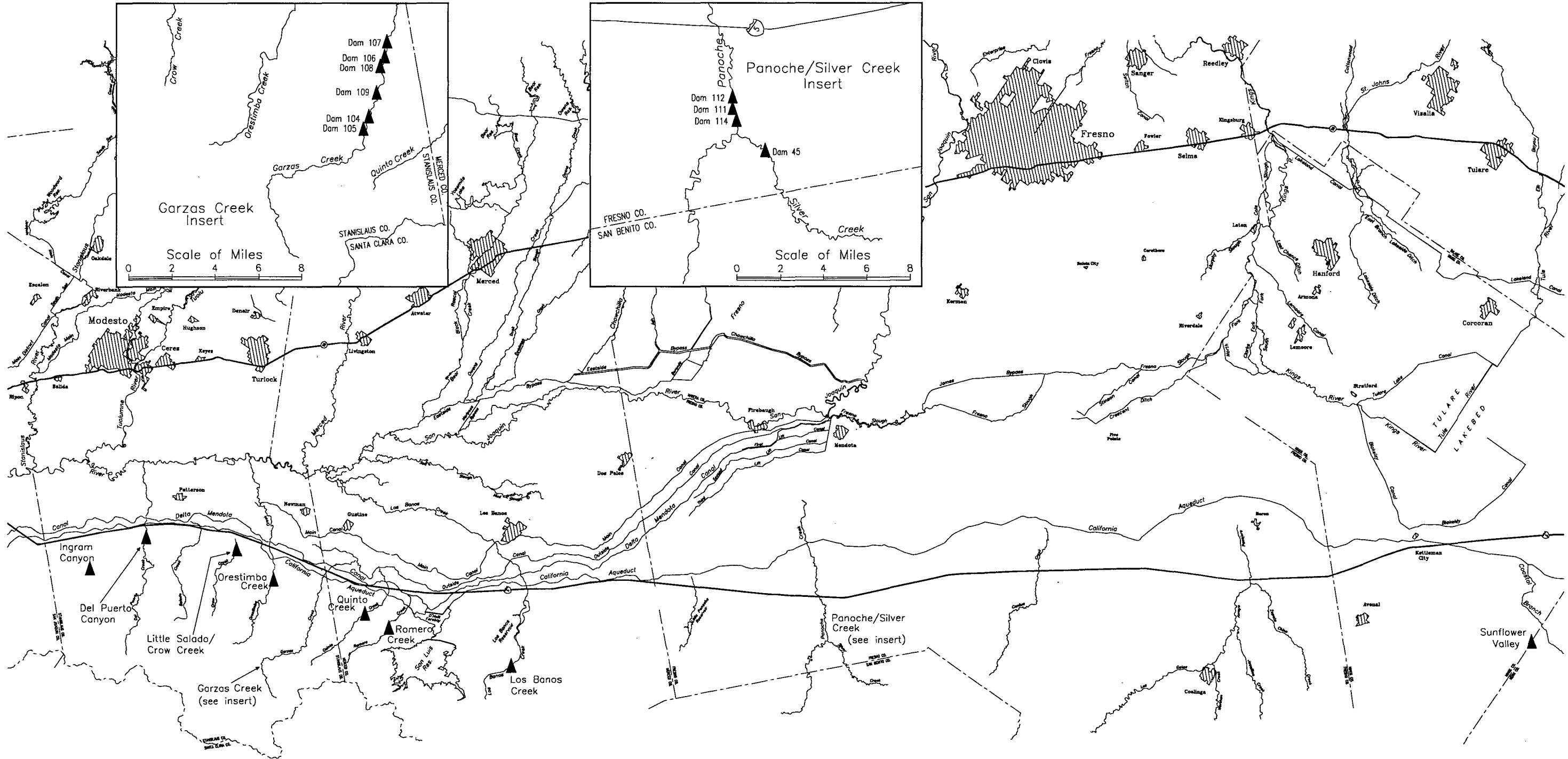


FIGURE 10
Alternative South-of-the-Delta Offstream Reservoir Sites
▲ Phase Two Potential Reservoir Sites

Scale of Miles
0 2 4 6 8

Sensitivity Analysis

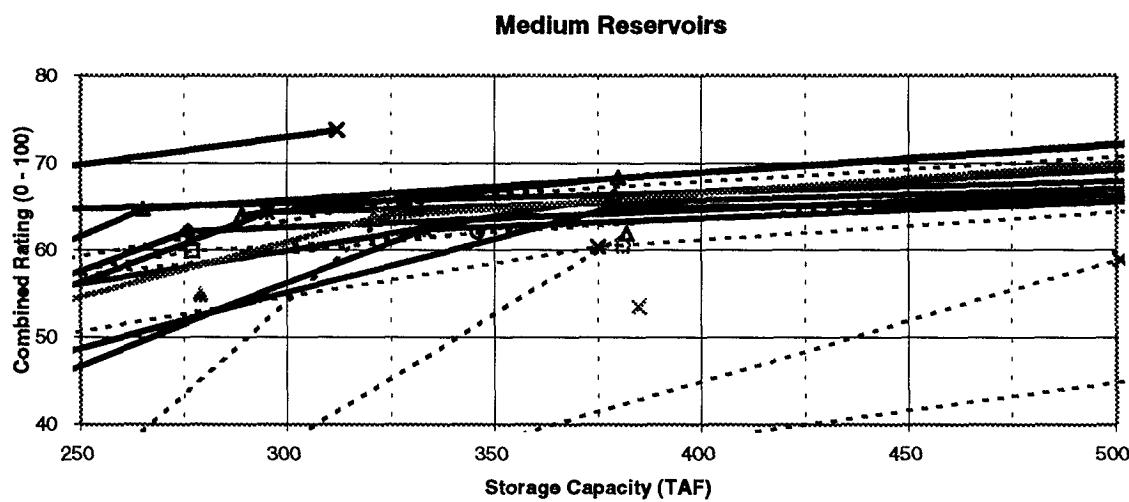
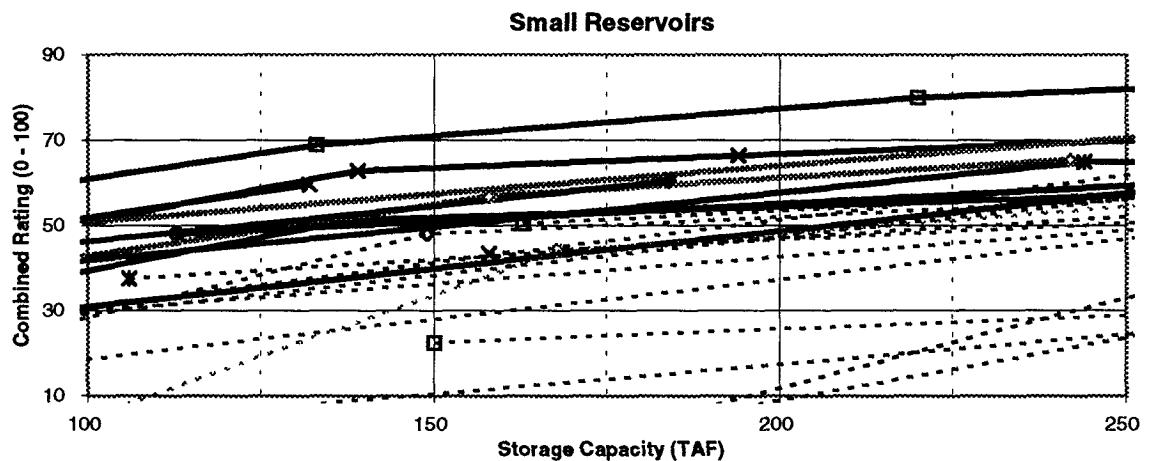
In the Phase One screening process, the combined scores for each alternative were computed by averaging the cost ratings and environmental sensitivity ratings as described above. This equal weighting of these two factors is fairly arbitrary -- arguments can be made for weighting either factor more heavily than the other. Both factors had potential scales of 0 to 100 points. However, in application, the cost scores ranged from 0 to 81 points, while the environmental sensitivity scores ranged from 29 to 61 points. CDFG staff raised concerns that this inequity in effective scales might not provide for sufficient consideration of environmental concerns in the screening process.

To address these concerns, a simple sensitivity analysis was performed to determine the effects of increasing the weight of the environmental factors on the screening process. The environmental sensitivity ratings for all alternatives were multiplied by a factor of two and total combined scores were re-computed. This had the effect of using a 2:1 weighting of environmental sensitivity ratings to cost ratings. Figures 11a and 11b depict combined rating versus storage capacity for all qualified alternatives as computed using the doubled environmental sensitivity ratings. In both figures, Phase One passing alternatives are represented with bold lines, while screened alternatives are shown with dashed lines.

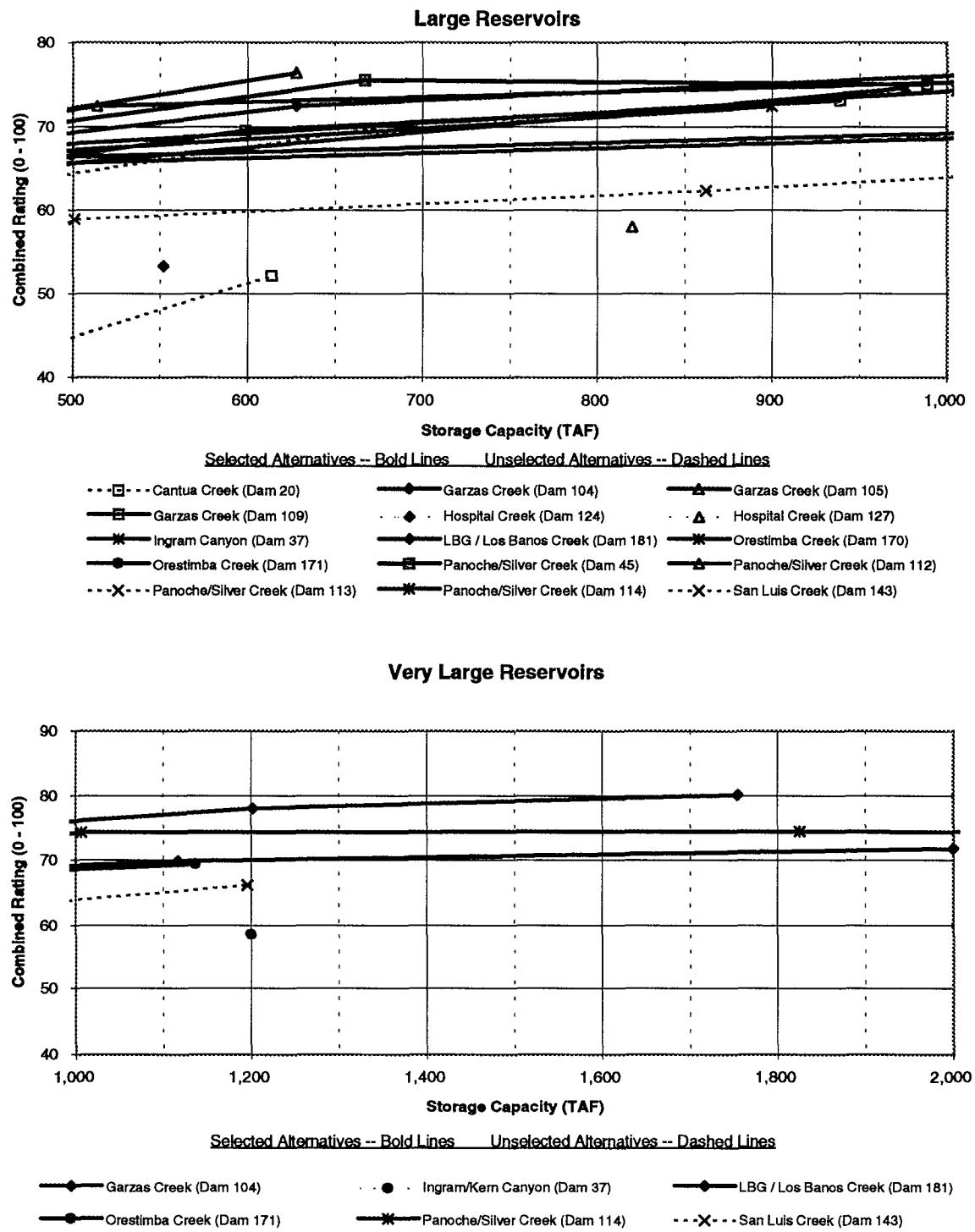
Comparing Figures 11a and 11b with Figures 9a and 9b shows that doubling the weight of the environmental sensitivity ratings would have little effect on the screening process. In the small reservoir category, Garzas Creek 104 and 109, Panoche/Silver Creek 112, and San Luis Creek 145 become marginally competitive. In the medium reservoir category, Panoche/Silver Creek 45 becomes highly competitive, Quinto Creek 54 becomes moderately competitive, and Garzas Creek 108 and 109 become marginally competitive. In the large reservoir category, Panoche/Silver Creek 113 becomes marginally competitive. No new alternatives become competitive in the very large reservoir category.

Of these alternatives, only San Luis Creek 145 and Panoche/Silver Creek 113 are sites that were not selected for any size category. All other sites would be studied in more detail during subsequent investigation. Four other dam sites were selected for Phase Two

**Figure 11a. Sensitivity Analysis: Combined Scores versus Storage Volume
Small and Medium Reservoirs**



**Figure 11b. Sensitivity Analysis: Combined Scores versus Storage Volume
Large and Very Large Reservoirs**



analysis in the Panoche/Silver Creek watershed; therefore, eliminating Panoche/Silver Creek 113 is of little concern. The average environmental sensitivity rating for San Luis Creek 145 (within the small reservoir category) is 49. The median environmental sensitivity rating for selected alternatives within the small reservoir category is 50. Eliminating San Luis Creek 145 will not result in the loss of a strong environmental alternative.

Based on this sensitivity analysis, it is concluded that the process used to select alternatives for subsequent investigation is reasonable and no competitive alternative with strong environmental benefits was eliminated in the Phase One screening. During subsequent investigation, more detailed environmental information will be developed and analyzed, leading to a more rigorous final reconnaissance-level screening process.

Conclusions

Some general conclusions, described below, can be drawn based on the Phase One evaluation. It must be noted that these conclusions are subject to change as more detailed information is developed during subsequent investigation.

- Los Banos Creek is clearly the most cost-effective alternative considered for size categories above 250,000 acre-feet. The next least costly alternative to LBG ranges from about 50 percent more expensive for the medium size category up to about 100 percent more expensive for the very large category.
- Los Banos Creek received the lowest environmental sensitivity rating (most potential impacts) of all passing alternatives. This may partly be an effect of the comparatively greater level of knowledge about this reservoir site. However, because of the relative greater diversity of estimated unit storage costs compared to the diversity of environmental sensitivity ratings among the alternatives, Los Banos Creek was the highest ranked alternative based on total combined rating for reservoir sizes above 250,000 acre-feet.
- For the medium, large, and very large size categories, the alternative with the highest environmental sensitivity rating is significantly more costly than the most economic alternative. The differences in environmental sensitivity rating between the best environmental alternative and the most economic alternative are less significant than the differences in cost, as indicated in Table 13.
- Smaller reservoirs have significantly higher unit storage costs than larger reservoirs. As indicated in the Table 13, the least expensive 2,000,000 acre-foot reservoir has an estimated unit cost of storage of approximately \$550, while the least expensive 250,000 acre-foot reservoir has an estimated unit cost of approximately \$1,620 per acre-foot -- nearly three times higher.

Table 13. Comparison of Best Environmental and Most Economical Alternatives

Storage Volume Category (thousand acre-feet)	Best Environmental Alternative		Most Economical Alternative	
	Environmental Sensitivity Rating (0-100)	Unit Cost (\$ per acre- foot)	Environmental Sensitivity Rating (0-100)	Unit Cost (\$ per acre- foot)
100 - 250 (Small)	59 - 61	1,620 - 2,990	59 - 61	1,620 - 2,990
250 - 500 (Medium)	54 - 55	2,090 - 2,950	33 - 35	1,000 - 1,660
500 - 1,000 (Large)	57 - 59	1,920 - 2,300	31 - 33	730 - 1,000
1,000 - 2,000 (Very Large)	52 - 53	1,310 - 1,600	31	550 - 730

- For reservoir sizes below 250,000 acre-feet, there are several alternatives with both lower unit storage costs and higher combined total ratings than Los Banos Creek. However, all alternatives towards the lower end of the scale become very expensive on a unit cost basis.

Appendix A

Summary and Chronology of South-of-the-Delta Offstream Reservoir Studies

Delta Offstream Storage Development

Progress Report

July 1966

The objective of this report was to determine the cost and firm yield of Delta surplus water through storage at the Los Banos Reservoir. The report documents the findings of operation studies, geological evaluation, preliminary design, and cost estimates of two proposed reservoirs: Los Banos Creek and Kettleman Plain. There was no environmental information presented in the report.

After initial field studies, several undesirable characteristics were noted at the Kettleman Plain site. Therefore, no plans were prepared for this site.

Remaining Potential Major Water Storage Development

In the Central Valley Basin

Memorandum Report

December 1967

This report summarizes the findings of 11 alternatives north and south of the Delta. Only two of the alternatives, Los Meganos (Los Vaqueros) and Los Banos Creek are south of the Delta. The recommendation of the report for south-of-the-Delta alternatives is to further investigate reservoir possibilities at Los Vaqueros and Los Banos sites.

Delta Alternatives***Memorandum Report******October 1976***

This memorandum report presents preliminary design and cost estimates of three alternative sites. The report presents limited environmental information. The three sites studied were Los Vaqueros, Los Banos Grandes and Sunflower.

Reconnaissance level designs and cost estimates were performed for the Los Vaqueros and the Los Banos Sites. Sunflower was eliminated due to a low storage availability and other engineering and environmental reasons.

State Water Project Future Supply Program***Alternative Offstream Storage Sites South of the Delta******Memorandum Report******November 1983***

This memorandum report estimates the embankment volumes and stripping quantities, and evaluates geological conditions and storage potential for 16 alternatives. There was no environmental information presented. The alternatives included:

- Kellogg
- Los Vaqueros (with and without Marsh Creek)
- Del Puerto Creek
- Little Salado/Crow Creeks
- Orestimba Creek (upper and lower regions)
- Garzas Creek (upper and lower regions)
- Romero Creek
- Los Banos Grandes
- Enlargement of Los Banos Detention Reservoir
- Salt Creek

- Ortigalita Creek
- Sunflower
- Enlargement of Little Panoche Detention Reservoir

The report concludes that the Los Banos Grandes Project is the most desirable from an economic standpoint. Romero, Little Salado/Crow, and Ortigalita creeks were considered undesirable due to the low ratio of storage to unit volume of embankment.

Alternative Plans for Offstream Storage South of the Delta

Progress Report

May 1984

Eighteen sites were considered for possible offstream storage sites in this progress report. Five sites were eliminated due to excessive cost: Corral Hollow Creek, Salado Creek, Quinto Creek, Enlargement of Little Panoche Detention Reservoir, and Buena Vista Lake. The sites considered for investigation were:

- Kellogg
- Los Vaqueros
- Del Puerto Creek
- Little Salado/Crow Creeks
- Orestimba Creek
- Garzas Creek
- Romero Creek
- Enlargement of Los Banos Detention Reservoir
- Los Banos Grandes
- Salt Creek
- Ortigalita Creek
- Sunflower

This report recommended further investigation of the Los Banos Grandes site. It also recommends that the Department coordinates with water agencies that show interest in developing a reservoir at Los Vaqueros and Kellogg Reservoir sites.

Los Banos Grandes Facilities***Alternative Analysis Memorandum Report******September 1990***

A total of 24 sites were identified as possible offstream storage sites in this memorandum report. Eight were defined as having potential for being practicable offstream storage sites, either individually or in combinations. The remaining sites were eliminated based on low physical feasibility or high cost. The recommended sites were:

- Los Vaqueros
- Kellogg and Marsh Creeks
- Del Puerto Creek
- Orestimba Creek
- Upper Garzas Creek
- Los Banos Grandes
- Orticalita Creek
- Sunflower

Los Banos Grandes was defined as the alternative most capable of meeting the project purpose at the lowest cost. The remaining seven sites were defined as technically feasible to meet the project purpose, but with costs two to four times that of the Los Banos Grandes site.

Appendix B

Engineering Data

Appendix B. Engineering Data

Alternative Offstream Reservoir	County Name(s) of Reservoir Location	Main Dam Number	Number of Saddle Dams	Dam Crest Elevation (feet)	Streambed Elevation at Damsite (feet)	Height of Dam Above Streambed (feet)	Total Embankment Volume (million yds ³)	Freeboard Allowance (feet)	Normal Operating Pool Water Surface Elevation (feet)	Normal Operating Pool Storage Capacity (TAF)	Maximum Water Surface Area (acres)	Minimum Water Surface Elevation at Aqueduct (feet)	Maximum Pumplift (feet)	Distance from California Aqueduct (miles)	Distance from Delta Pumping Plant (miles)	Alternative Offstream Reservoir
Arroyo Cielvo 1	Fresno	4	2	2,000	1,310	690	150.0	30	1,970	278	1,299	324	1,646	7.0	123	Arroyo Cielvo 1
Arroyo Cielvo 2	Fresno	4	0	1,800	1,310	490	62.6	25	1,775	105	655	324	1,451	7.0	123	Arroyo Cielvo 2
Arroyo Hondo 1	Fresno	7	3	2,000	1,190	810	334.3	30	1,970	896	3,754	319	1,651	14.3	137	Arroyo Hondo 1
Arroyo Hondo 2	Fresno	7	0	1,920	1,190	730	252.2	30	1,890	641	3,101	319	1,571	14.3	137	Arroyo Hondo 2
Arroyo Hondo 3	Fresno	14	1	1,600	950	650	157.1	30	1,570	674	3,394	319	1,251	11.6	137	Arroyo Hondo 3
Arroyo Hondo 4	Fresno	14	0	1,520	950	570	111.2	29	1,491	456	2,711	319	1,172	11.6	137	Arroyo Hondo 4
Arroyo Hondo 5	Fresno	7	0	1,800	1,190	610	161.3	30	1,770	356	2,135	319	1,451	14.3	137	Arroyo Hondo 5
Arroyo Hondo 6	Fresno	7	0	1,600	1,190	410	52.9	21	1,579	100	883	319	1,260	14.3	137	Arroyo Hondo 6
Arroyo Hondo 7	Fresno	14	0	1,400	950	450	61.8	23	1,377	232	1,694	319	1,058	11.6	137	Arroyo Hondo 7
Arroyo Hondo 8	Fresno	11	2	1,000	790	210	10.0	11	989	75	887	319	670	10.5	137	Arroyo Hondo 8
Bitter Creek 1	Kern	16	0	1,750	1,340	410	39.9	21	1,729	192	1,440	497	1,232	6.8	260	Bitter Creek 1
Bitter Creek 2	Kern	17	0	3,000	1,990	1,010	295.8	30	2,970	462	1,517	497	2,473	9.8	260	Bitter Creek 2
Bitter Creek 3	Kern	123	0	2,250	1,640	610	56.5	30	2,220	101	595	497	1,723	8.4	260	Bitter Creek 3
Bitterwater Valley 1	Kern/San Luis Obispo	18	0	1,700	1,350	350	38.1	18	1,682	396	3,633	304	1,379	21.0	206	Bitterwater Valley 1
Bitterwater Valley 2	Kern/San Luis Obispo	128	1	1,600	1,350	250	17.7	13	1,587	145	1,744	304	1,284	21.1	206	Bitterwater Valley 2
Bitterwater Valley 3	Kern/San Luis Obispo	128	0	1,500	1,350	150	6.3	8	1,492	40	690	304	1,188	21.1	206	Bitterwater Valley 3
Broad Creek	Kern	98	1	800	665	135	4.1	7	793	31	756	294	499	5.0	248	Broad Creek
Buena Vista Creek	Kern	97	0	800	665	135	11.7	7	793	59	1,138	294	499	6.5	248	Buena Vista Creek
Buena Vista Lake Bed	Kern	-	0	290	270	20	0.0	0	290	91	17,983	294	10	0.1	247	Buena Vista Lake Bed
Cantua Creek 1	Fresno	116	1	1,600	950	650	773.2	30	1,570	1,327	5,752	319	1,251	9.4	133	Cantua Creek 1
Cantua Creek 2	Fresno	20	0	1,400	910	490	107.1	25	1,375	614	3,903	319	1,056	8.8	133	Cantua Creek 2
Cantua Creek 3	Fresno	22	1	1,200	830	370	36.8	19	1,181	249	2,110	319	862	8.0	133	Cantua Creek 3
Cantua Creek 4	Fresno	21	0	800	590	210	16.8	11	789	82	1,077	319	470	5.7	133	Cantua Creek 4
Cantua Creek 5	Fresno	116	0	1,400	950	450	359.6	23	1,377	513	3,347	319	1,058	9.4	133	Cantua Creek 5
Cantua Creek 6	Fresno	116	0	1,200	950	250	112.3	13	1,187	117	1,221	319	868	9.4	133	Cantua Creek 6
Cantua Creek 7	Fresno	20	0	1,200	910	290	19.3	15	1,185	150	1,487	319	866	8.8	133	Cantua Creek 7
Capita Canyon	Fresno	42	0	1,400	1,030	370	19.0	19	1,381	27	165	328	1,053	5.6	104	Capita Canyon
Castac Valley 1	Kern/Los Angeles	47	1	4,000	3,490	510	230.9	26	3,974	826	2,755	1,238	2,736	6.6	292	Castac Valley 1
Castac Valley 2	Kern	117	0	3,250	1,740	1,510	792.1	30	3,220	1,206	3,097	1,238	1,982	2.3	292	Castac Valley 2
Castac Valley 3	Kern	117	0	3,000	1,740	1,260	442.1	30	2,970	641	1,745	1,238	1,732	2.3	292	Castac Valley 3
Castac Valley 4	Kern	117	0	2,750	1,740	1,010	221.6	30	2,720	317	1,019	1,238	1,482	2.3	292	Castac Valley 4
Castac Valley 5	Kern	117	0	2,500	1,740	760	97.6	30	2,470	135	551	1,238	1,232	2.3	292	Castac Valley 5
Deep Gulch	San Joaquin	28	1	800	510	290	7.2	15	785	58	634	230	555	4.2	18	Deep Gulch
Del Puerto Canyon 1	Stanislaus	191	1	460	200	260	6.2	13	447	88	897	230	217	0.4	37	Del Puerto Canyon 1
Del Puerto Canyon 2	Stanislaus	193	0	600	260	340	13.4	17	583	94	969	230	353	1.9	37	Del Puerto Canyon 2
Del Puerto Canyon 3	Stanislaus	194	0	720	280	440	36.7	22	698	191	1,656	230	468	2.1	37	Del Puerto Canyon 3
Del Puerto Canyon 4	Stanislaus	193	0	500	260	240	6.0	12	488	35	430	230	258	1.9	37	Del Puerto Canyon 4
Del Puerto Canyon 5	Stanislaus	194	0	600	280	320	16.6	16	584	71	757	230	354	2.1	37	Del Puerto Canyon 5

D - 0 0 3 9 1 8

Appendix B. Engineering Data

Alternative Offstream Reservoir	County Name(s) of Reservoir Location	Main Dam Number	Number of Saddle Dams	Dam Crest Elevation (feet)	Streambed Elevation at Damsite (feet)	Height of Dam Above Streambed (feet)	Total Embankment Volume (million yds ³)	Freeboard Allowance (feet)	Normal Operating Pool Water Surface Elevation (feet)	Normal Operating Pool Storage Capacity (TAF)	Maximum Water Surface Area (acres)	Minimum Water Surface Elevation at Aqueduct (feet)	Maximum Pumplift (feet)	Distance from California Aqueduct (miles)	Distance from Delta Pumping Plant (miles)	Alternative Offstream Reservoir
Garzas Creek 1	Stanislaus	104	0	1,200	470	730	155.5	30	1,170	1,754	8,181	250	920	5.6	57	Garzas Creek 1
Garzas Creek 2	Stanislaus	105	0	1,000	470	530	52.4	27	973	628	4,225	250	723	5.6	57	Garzas Creek 2
Garzas Creek 3	Stanislaus	106	0	700	310	390	23.3	20	680	312	2,715	250	430	2.9	57	Garzas Creek 3
Garzas Creek 4	Stanislaus	107	0	600	280	320	23.5	16	584	262	2,232	250	334	1.9	57	Garzas Creek 4
Garzas Creek 5	Stanislaus	108	2	800	310	490	79.9	25	775	574	4,509	250	525	2.9	57	Garzas Creek 5
Garzas Creek 6	Stanislaus	109	1	1,000	390	610	108.4	30	970	939	5,777	250	720	4.3	57	Garzas Creek 6
Garzas Creek 7	Stanislaus	108	0	720	310	410	54.0	21	699	346	2,631	250	449	2.9	57	Garzas Creek 7
Garzas Creek 8	Stanislaus	108	0	600	310	290	19.0	15	585	138	1,411	250	335	2.9	57	Garzas Creek 8
Garzas Creek 9	Stanislaus	109	0	920	390	530	78.1	27	893	599	4,204	250	643	4.3	57	Garzas Creek 9
Garzas Creek 10	Stanislaus	109	0	800	390	410	36.0	21	779	277	2,266	250	529	4.3	57	Garzas Creek 10
Garzas Creek 11	Stanislaus	109	0	720	390	330	21.8	17	703	163	1,251	250	453	4.3	57	Garzas Creek 11
Garzas Creek 12	Stanislaus	105	0	920	470	450	35.9	23	897	380	3,065	250	647	5.6	57	Garzas Creek 12
Garzas Creek 13	Stanislaus	105	0	880	470	410	26.3	21	859	289	2,759	250	609	5.6	57	Garzas Creek 13
Garzas Creek 14	Stanislaus	106	0	600	310	290	9.4	15	585	139	1,416	250	335	2.9	57	Garzas Creek 14
Garzas Creek 15	Stanislaus	106	0	640	310	330	14.6	17	623	194	2,002	250	373	2.9	57	Garzas Creek 15
Garzas Creek 16	Stanislaus	107	0	400	280	120	1.8	6	394	24	473	250	144	1.9	57	Garzas Creek 16
Garzas Creek 17	Stanislaus	107	0	480	280	200	7.3	10	470	75	973	250	220	1.9	57	Garzas Creek 17
Garzas Creek 18	Stanislaus	104	0	1,120	470	650	108.1	30	1,090	1,202	6,705	250	840	5.6	57	Garzas Creek 18
Garzas Creek 19	Stanislaus	104	0	1,000	470	530	67.2	27	973	628	4,293	250	723	5.6	57	Garzas Creek 19
Garzas Creek 20	Stanislaus	104	0	920	470	450	40.9	23	897	379	3,053	250	647	5.6	57	Garzas Creek 20
Garzas Creek 21	Stanislaus	104	0	800	470	330	14.0	17	783	149	1,531	250	533	5.6	57	Garzas Creek 21
Garzas Creek 22	Stanislaus	104	0	720	470	250	6.8	13	707	72	782	250	457	5.6	57	Garzas Creek 22
Garzas Creek 23	Stanislaus	104	0	740	470	270	8.3	14	726	86	969	250	476	5.6	57	Garzas Creek 23
Garzas Creek 24	Stanislaus	106	0	540	310	230	5.2	12	528	79	1,212	250	278	2.9	57	Garzas Creek 24
Garzas Creek 25	Stanislaus	108	0	540	310	230	11.3	12	528	79	1,194	250	278	2.9	57	Garzas Creek 25
Hospital Creek 1	San Joaquin/Stanislaus	35	0	1,000	470	530	73.3	27	973	385	2,122	230	743	3.2	25	Hospital Creek 1
Hospital Creek 2	San Joaquin/Stanislaus	124	1	1,520	790	730	99.7	30	1,490	552	2,674	230	1,260	7.6	25	Hospital Creek 2
Hospital Creek 3	San Joaquin/Stanislaus	126	0	1,800	910	890	321.2	30	1,770	1,155	4,205	230	1,540	8.4	25	Hospital Creek 3
Hospital Creek 4	San Joaquin/Stanislaus	127	0	1,200	490	710	166.5	30	1,170	820	3,544	230	940	3.8	25	Hospital Creek 4
Hospital Creek 5	San Joaquin/Stanislaus	36	0	600	440	160	4.7	8	592	18	283	230	362	3.0	25	Hospital Creek 5
Hospital Creek 6	San Joaquin/Stanislaus	36	0	800	440	360	30.1	18	782	152	1,302	230	552	3.0	25	Hospital Creek 6
Ingram Canyon 1	Stanislaus	37	1	1,200	490	710	83.0	30	1,170	977	4,524	230	940	2.3	33	Ingram Canyon 1
Ingram Canyon 2	Stanislaus	37	0	1,000	490	510	32.1	26	974	333	2,599	230	744	2.3	33	Ingram Canyon 2
Ingram Canyon 3	Stanislaus	37	0	800	490	310	7.2	16	784	67	633	230	554	2.3	33	Ingram Canyon 3
Ingram/Kern Canyon	Stanislaus	37	1	1,200	490	710	216.9	30	1,170	1,201	5,784	230	940	2.3	33	Ingram/Kern Canyon
Kern Canyon	Stanislaus	40	1	1,200	610	590	134.4	30	1,170	223	1,260	230	940	2.0	35	Kern Canyon
Kettleman Plain 1	Kings	99	2	500	390	110	4.9	6	494	283	9,146	310	184	4.0	186	Kettleman Plain 1
Kettleman Plain 2	Kings	99	0	475	390	85	2.9	4	471	133	5,542	310	161	4.0	186	Kettleman Plain 2
Kettleman Plain 3	Kings	99	0	490	390	100	4.0	5	485	220	7,695	310	175	4.0	186	Kettleman Plain 3
Kettleman Plain 4	Kings	99	0	465	390	75	2.3	4	461	89	4,178	310	151	4.0	186	Kettleman Plain 4

Appendix B. Engineering Data

Alternative Offstream Reservoir	County Name(s) of Reservoir Location	Main Dam Number	Number of Saddle Dams	Dam Crest Elevation (feet)	Streambed Elevation at Damsite (feet)	Height of Dam Above Streambed (feet)	Total Embankment Volume (million yds ³)	Freeboard Allowance (feet)	Normal Operating Pool Water Surface Elevation (feet)	Normal Operating Pool Storage Capacity (TAF)	Maximum Water Surface Area (acres)	Minimum Water Surface Elevation at Aqueduct (feet)	Maximum Pumplift (feet)	Distance from California Aqueduct (miles)	Distance from Delta Pumping Plant (miles)	Alternative Offstream Reservoir
Laguna Seca Creek 1	Merced	70	1	1,000	630	370	34.6	19	981	228	3,324	331	650	3.5	89	Laguna Seca Creek 1
Laguna Seca Creek 2	Merced	131	0	900	570	330	12.5	17	883	85	1,209	331	552	2.3	89	Laguna Seca Creek 2
Laguna Seca Creek 3	Merced	73	0	800	490	310	13.1	16	784	53	591	331	453	1.9	89	Laguna Seca Creek 3
Laguna Seca Creek 4	Merced	72	0	600	400	200	3.5	10	590	24	355	331	259	0.8	89	Laguna Seca Creek 4
Little Panoche Creek 1	Fresno	76	0	900	610	290	26.8	15	885	279	3,214	328	557	5.7	97	Little Panoche Creek 1
Little Panoche Creek 2	Fresno	146	0	800	590	210	8.3	11	789	107	1,747	328	461	5.3	97	Little Panoche Creek 2
Little Salado/Crow Creek 1	Stanislaus	63	3	400	290	110	11.5	6	394	132	2,910	230	164	1.3	46	Little Salado/Crow Creek 1
Little Salado/Crow Creek 2	Stanislaus	67	2	800	430	370	52.1	19	781	250	2,084	230	551	3.8	46	Little Salado/Crow Creek 2
Little Salado/Crow Creek 3	Stanislaus	63	0	360	290	70	3.0	4	356	49	1,760	230	126	1.3	46	Little Salado/Crow Creek 3
Little Salado/Crow Creek 4	Stanislaus	63	0	340	290	50	1.5	4	336	22	1,150	230	106	1.3	46	Little Salado/Crow Creek 4
Lone Tree Creek 1	San Joaquin	30	1	880	630	250	8.2	13	867	53	620	230	637	4.2	25	Lone Tree Creek 1
Lone Tree Creek 2	San Joaquin	139	3	1,400	750	650	122.8	30	1,370	432	2,156	230	1,140	5.9	25	Lone Tree Creek 2
Lone Tree Creek 3	San Joaquin	139	0	1,200	750	450	51.2	23	1,177	155	1,023	230	947	5.9	25	Lone Tree Creek 3
Lone Tree Creek 4	San Joaquin	33	1	800	550	250	10.3	13	787	63	639	230	557	3.8	25	Lone Tree Creek 4
Lone Tree Creek 5	San Joaquin	32	0	600	430	170	5.1	9	591	19	294	230	361	2.5	25	Lone Tree Creek 5
Los Banos Creek 1	Merced	181	7	800	369	431	29.2	22	778	2,000	14,710	222	556	2.8	80	Los Banos Creek 1
Los Banos Creek 2	Merced	181	1	720	369	351	13.7	18	702	1,117	11,442	222	480	2.8	80	Los Banos Creek 2
Los Banos Creek 3	Merced	181	1	640	369	271	4.9	14	626	477	7,194	222	404	2.8	80	Los Banos Creek 3
Los Banos Creek 4	Merced	181	1	600	369	231	2.6	12	588	276	4,932	222	366	2.8	80	Los Banos Creek 4
Los Banos Creek 5	Merced	181	0	520	369	151	1.0	8	512	67	1,485	222	290	2.8	80	Los Banos Creek 5
Los Gatos Creek 1	Fresno	26	0	1,800	1,030	770	344.8	30	1,770	2,500	10,679	313	1,457	22.5	164	Los Gatos Creek 1
Los Gatos Creek 2	Fresno	100	0	1,560	990	570	260.6	29	1,531	1,167	6,480	313	1,218	21.7	164	Los Gatos Creek 2
Los Gatos Creek 3	Fresno	102	0	1,400	1,070	330	22.5	17	1,383	170	1,528	313	1,070	22.9	164	Los Gatos Creek 3
Los Gatos Creek 4	Fresno	103	0	1,400	1,030	370	57.4	19	1,381	295	2,419	313	1,068	22.5	164	Los Gatos Creek 4
Los Gatos Creek 5	Fresno	27	0	1,000	880	120	2.4	6	994	24	602	313	681	20.2	164	Los Gatos Creek 5
McKittrick Valley	Kern	93	3	1,000	840	160	7.0	8	992	89	2,010	301	691	6.5	228	McKittrick Valley
Moreno Gulch 1	Fresno	43	0	1,800	1,190	610	177.1	30	1,770	598	2,847	327	1,443	6.1	103	Moreno Gulch 1
Moreno Gulch 2	Fresno	121	1	1,600	1,030	570	52.8	29	1,571	265	1,746	327	1,244	5.7	103	Moreno Gulch 2
Moreno Gulch 3	Fresno	121	0	1,400	1,030	370	15.3	19	1,381	68	607	327	1,054	5.7	103	Moreno Gulch 3
Moreno Gulch 4	Fresno	44	0	1,200	910	290	15.0	15	1,185	36	345	327	858	4.8	103	Moreno Gulch 4
Mustang Creek	Merced	50	3	700	390	310	19.3	16	684	60	490	216	468	1.5	60	Mustang Creek
Orestimba Creek 1	Stanislaus	171	2	800	280	520	133.4	26	774	1,137	5,681	230	544	3.0	51	Orestimba Creek 1
Orestimba Creek 2	Stanislaus	171	0	600	280	320	43.5	16	584	378	2,914	230	354	3.0	51	Orestimba Creek 2
Orestimba Creek 3	Stanislaus	170	0	1,000	380	620	69.5	30	970	900	5,694	230	740	5.1	51	Orestimba Creek 3
Orestimba Creek 4	Stanislaus	170	0	800	380	420	23.6	21	779	295	1,703	230	549	5.1	51	Orestimba Creek 4
Orestimba Creek 5	Stanislaus	170	0	600	380	220	3.6	11	589	75	775	230	359	5.1	51	Orestimba Creek 5
Orestimba Creek 6	Stanislaus	171	0	400	280	120	3.2	6	394	48	804	230	164	3.0	51	Orestimba Creek 6
Ortigalita Creek	Merced	176	0	800	560	240	8.6	12	788	100	2,049	214	574	5.0	83	Ortigalita Creek
Oso Creek 1	Stanislaus	138	1	800	430	370	34.0	19	781	116	983	230	551	4.3	51	Oso Creek 1
Oso Creek 2	Stanislaus	160	0	800	470	330	22.5	17	783	83	785	230	553	4.6	51	Oso Creek 2

Appendix B. Engineering Data

Alternative Offstream Reservoir	County Name(s) of Reservoir Location	Main Dam Number	Number of Saddle Dams	Dam Crest Elevation (feet)	Streambed Elevation at Damsite (feet)	Height of Dam Above Streambed (feet)	Total Embankment Volume (million yds ³)	Freeboard (feet)	Normal Operating Pool Water Surface Elevation (feet)	Normal Operating Pool Storage Capacity (TAF)	Maximum Water Surface Area (acres)	Minimum Water Surface Elevation at Aqueduct (feet)	Maximum Pumplift (feet)	Distance from California Aqueduct (miles)	Distance from Delta Pumping Plant (miles)	Alternative Offstream Reservoir
Packwood Creek 1	Kern	79	4	1,200	910	290	28.0	15	1,185	277	3,046	304	882	17.5	206	Packwood Creek 1
Packwood Creek 2	Kern	130	0	1,100	930	170	5.5	9	1,091	92	1,483	304	788	17.7	206	Packwood Creek 2
Panoche Hills	Fresno	132	1	1,100	830	270	13.6	14	1,086	85	1,059	328	758	6.1	97	Panoche Hills
Panoche/Silver Creek 1	Fresno/San Benito	45	0	1,200	630	570	124.5	29	1,171	989	5,450	328	843	8.7	109	Panoche/Silver Creek 1
Panoche/Silver Creek 2	Fresno/San Benito	111	0	800	590	210	15.8	11	789	242	2,627	328	461	3.3	109	Panoche/Silver Creek 2
Panoche/Silver Creek 3	Fresno/San Benito	112	0	1,000	550	450	84.0	23	977	1,068	6,293	328	649	3.2	109	Panoche/Silver Creek 3
Panoche/Silver Creek 4	Fresno/San Benito	113	0	1,200	670	530	94.0	27	1,173	672	6,773	328	845	5.1	109	Panoche/Silver Creek 4
Panoche/Silver Creek 5	Fresno/San Benito	114	1	1,200	590	610	215.9	30	1,170	2,647	15,085	328	842	3.4	109	Panoche/Silver Creek 5
Panoche/Silver Creek 6	Fresno/San Benito	111	0	720	590	130	5.6	7	713	91	1,583	328	385	3.3	109	Panoche/Silver Creek 6
Panoche/Silver Creek 7	Fresno/San Benito	111	0	760	590	170	9.9	9	751	158	2,135	328	423	3.3	109	Panoche/Silver Creek 7
Panoche/Silver Creek 8	Fresno/San Benito	112	0	800	550	250	21.3	13	787	265	2,817	328	459	3.2	109	Panoche/Silver Creek 8
Panoche/Silver Creek 9	Fresno/San Benito	112	0	880	550	330	41.0	17	863	514	4,307	328	535	3.2	109	Panoche/Silver Creek 9
Panoche/Silver Creek 10	Fresno/San Benito	45	0	1,120	630	490	75.4	25	1,095	667	4,034	328	767	8.7	109	Panoche/Silver Creek 10
Panoche/Silver Creek 11	Fresno/San Benito	45	0	1,000	630	370	34.3	19	981	328	2,501	328	653	8.7	109	Panoche/Silver Creek 11
Panoche/Silver Creek 12	Fresno/San Benito	45	0	800	630	170	5.3	9	791	46	724	328	463	8.7	109	Panoche/Silver Creek 12
Panoche/Silver Creek 13	Fresno/San Benito	113	0	1,120	670	450	64.1	23	1,097	375	3,304	328	769	5.1	109	Panoche/Silver Creek 13
Panoche/Silver Creek 14	Fresno/San Benito	113	0	1,000	670	330	26.0	17	983	158	1,240	328	655	5.1	109	Panoche/Silver Creek 14
Panoche/Silver Creek 15	Fresno/San Benito	114	0	1,120	590	530	154.9	27	1,093	1,825	10,017	328	765	3.4	109	Panoche/Silver Creek 15
Panoche/Silver Creek 16	Fresno/San Benito	114	0	1,000	590	410	85.8	21	979	1,006	6,028	328	651	3.4	109	Panoche/Silver Creek 16
Panoche/Silver Creek 17	Fresno/San Benito	114	0	800	590	210	17.2	11	789	244	2,574	328	461	3.4	109	Panoche/Silver Creek 17
Panoche/Silver Creek 18	Fresno/San Benito	114	0	720	590	130	6.0	7	713	92	1,557	328	385	3.4	109	Panoche/Silver Creek 18
Panoche/Silver Creek 19	Fresno/San Benito	112	0	700	550	150	8.1	8	692	77	1,566	328	364	3.2	109	Panoche/Silver Creek 19
Pleito Creek 1	Kern	86	0	3,000	1,650	1,350	816.6	30	2,970	783	1,977	492	2,478	6.5	274	Pleito Creek 1
Pleito Creek 2	Kern	118	1	3,750	2,140	1,610	900.5	30	3,720	2,447	5,392	492	3,228	7.4	274	Pleito Creek 2
Pleito Creek 3	Kern	118	0	3,500	2,140	1,360	601.0	30	3,470	1,357	3,730	492	2,978	7.4	274	Pleito Creek 3
Pleito Creek 4	Kern	118	0	3,250	2,140	1,110	331.4	30	3,220	662	2,198	492	2,728	7.4	274	Pleito Creek 4
Pleito Creek 5	Kern	118	0	3,000	2,140	860	149.9	30	2,970	284	1,087	492	2,478	7.4	274	Pleito Creek 5
Pleito Creek 6	Kern	118	0	2,750	2,140	610	56.5	30	2,720	104	501	492	2,228	7.4	274	Pleito Creek 6
Quinto Creek 1	Merced	54	1	600	315	285	34.3	14	586	332	3,239	216	370	1.9	64	Quinto Creek 1
Quinto Creek 2	Merced/Stanislaus	101	0	800	390	410	47.4	21	779	381	2,509	216	563	3.8	64	Quinto Creek 2
Quinto Creek 3	Merced/Stanislaus	54	0	500	315	185	13.3	9	491	113	1,738	216	275	1.9	64	Quinto Creek 3
Romero Creek 1	Merced	56	3	600	315	285	21.4	14	586	184	1,589	216	370	2.0	66	Romero Creek 1
Romero Creek 2	Merced	56	2	520	315	205	9.5	10	510	88	1,054	216	294	2.0	66	Romero Creek 2
Salado Creek 1	Merced	62	0	900	530	370	21.5	19	881	78	777	230	651	3.5	43	Salado Creek 1
Salado Creek 2	Merced	135	1	900	490	410	29.4	21	879	147	1,191	230	649	2.9	43	Salado Creek 2
Salado Creek 3	Merced	137	0	1,200	690	510	40.4	26	1,174	382	3,086	230	944	4.8	43	Salado Creek 3
Salado Creek 4	Merced	137	0	1,000	690	310	9.3	16	984	58	825	230	754	4.8	43	Salado Creek 4
Salt Creek 1-Fresno Co.	---	24	3	1,400	870	530	70.2	27	1,373	380	2,519	319	1,054	8.0	136	Salt Creek 1-Fresno Co.
Salt Creek 2-Fresno Co.	---	24	0	1,360	870	490	56.3	25	1,335	328	2,105	319	1,016	8.0	136	Salt Creek 2-Fresno Co.
Salt Creek 3-Fresno Co.	---	24	0	1,200	870	330	21.6	17	1,183	117	980	319	864	8.0	136	Salt Creek 3-Fresno Co.

Appendix B. Engineering Data

Alternative Offstream Reservoir	County Name(s) of Reservoir Location	Main Dam Number	Number of Saddle Dams	Dam Crest Elevation (feet)	Streambed Elevation at Damsite (feet)	Height of Dam Above Streambed (feet)	Total Embankment Volume (million yds ³)	Freeboard Allowance (feet)	Normal Operating Pool Water Surface Elevation (feet)	Normal Operating Pool Storage Capacity (TAF)	Maximum Water Surface Area (acres)	Minimum Water Surface Elevation at Aqueduct (feet)	Maximum Pumplift (feet)	Distance from California Aqueduct (miles)	Distance from Delta Pumping Plant (miles)	Alternative Offstream Reservoir
Salt Creek 1-Kern Co.		91	0	3,500	2,740	760	135.2	30	3,470	283	1,221	1,241	2,229	5.7	284	Salt Creek 1-Kern Co.
Salt Creek 2-Kern Co.		134	0	2,750	1,940	810	117.6	30	2,720	323	1,309	1,241	1,479	3.2	284	Salt Creek 2-Kern Co.
Salt Creek 3-Kern Co.		134	0	2,500	1,940	560	32.9	28	2,472	105	613	1,241	1,231	3.2	284	Salt Creek 3-Kern Co.
Salt Creek 1-Merced Co.		1	0	500	390	110	0.9	6	494	61	1,576	215	279	2.5	82	Salt Creek 1-Merced Co.
Salt Creek 2-Merced Co.		148	2	520	410	110	2.8	6	514	72	1,950	215	299	2.9	82	Salt Creek 2-Merced Co.
San Emigdio Creek 1	Kern	77	0	2,500	2,090	410	63.3	21	2,479	101	901	495	1,984	8.2	268	San Emigdio Creek 1
San Emigdio Creek 2	Kern	120	0	4,250	2,990	1,260	338.6	30	4,220	757	1,908	495	3,725	3.2	268	San Emigdio Creek 2
San Luis Creek 1	Merced	143	1	1,200	470	730	170.3	30	1,170	1,196	4,898	240	930	4.6	72	San Luis Creek 1
San Luis Creek 2	Merced	143	0	1,120	470	650	131.8	30	1,090	862	4,063	240	850	4.6	72	San Luis Creek 2
San Luis Creek 3	Merced	143	0	1,000	470	530	72.8	27	973	501	2,757	240	733	4.6	72	San Luis Creek 3
San Luis Creek 4	Merced	143	0	720	470	250	10.9	13	707	70	780	240	467	4.6	72	San Luis Creek 4
San Luis Creek 5	Merced	145	0	720	390	330	36.5	17	703	282	2,114	240	463	4.6	72	San Luis Creek 5
San Luis Creek 6	Merced	145	0	600	390	210	10.4	11	589	106	1,198	240	349	4.6	72	San Luis Creek 6
Sandy Creek	Kern	92	0	750	565	185	14.2	9	741	50	990	499	242	1.6	254	Sandy Creek
Santiago Creek 1	Kern	19	0	3,000	2,340	660	252.3	30	2,970	459	1,815	497	2,473	10.0	264	Santiago Creek 1
Santiago Creek 2	Kern	19	0	2,750	2,340	410	84.6	21	2,729	147	960	497	2,232	10.0	264	Santiago Creek 2
Sunflower Valley 1	Kings/Kern	177	5	700	575	125	9.3	6	694	535	10,777	309	386	10.0	186	Sunflower Valley 1
Sunflower Valley 2	Kings/Kern	177	4	675	575	100	5.8	5	670	322	8,198	309	361	10.0	186	Sunflower Valley 2
Sunflower Valley 3	Kings/Kern	177	0	650	575	75	3.3	4	646	168	5,617	309	337	10.0	186	Sunflower Valley 3
Sunflower Valley 4	Kings/Kern	177	0	625	575	50	1.5	4	621	66	3,261	309	312	10.0	186	Sunflower Valley 4
Wildcat Canyon	Merced/Fresno	74	0	1,000	710	290	15.6	15	985	79	1,185	331	654	4.6	95	Wildcat Canyon

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Appendix C

Cost Estimates

Appendix C. Cost Estimates (in \$ Million)

Alternative Offstream Reservoir	Main Dam Number	Embankment Construction Cost	Spillway Cost	Project Lands Cost	Pumping-Generating Facility Cost	Penstock Cost	Conveyance Facilities Cost	Outlet Works Cost	Emergency Release Facilities Cost	General Reservoir Cost	Misc. Cost	Roads Cost	Mitigation Cost	Recreation Cost	Initial Filling Cost	Bond Financing Cost	Total Capital Cost	Alternative Offstream Reservoir
Arroyo Cielvo 1	4	1,353.0	34.8	2.2	334.1	17.7	155.2	16.7	0.9	2.2	9.7	3.5	10.6	1.4	8.9	116.4	2,067	Arroyo Cielvo 1
Arroyo Cielvo 2	4	564.7	24.7	1.2	310.3	12.5	155.2	6.3	0.3	1.1	3.7	1.8	5.4	0.7	3.4	65.2	1,157	Arroyo Cielvo 2
Arroyo Hondo 1	7	3,015.4	40.9	6.5	334.5	20.7	317.1	53.8	2.8	6.4	31.4	10.1	32.0	4.1	28.7	232.3	4,137	Arroyo Hondo 1
Arroyo Hondo 2	7	2,274.8	36.9	5.3	325.0	18.7	317.1	38.5	2.0	5.3	22.4	8.4	26.5	3.4	20.5	184.9	3,290	Arroyo Hondo 2
Arroyo Hondo 3	14	1,417.0	32.8	5.9	284.3	16.6	257.2	40.4	2.1	5.8	23.6	9.2	29.0	3.7	21.6	127.4	2,277	Arroyo Hondo 3
Arroyo Hondo 4	14	1,003.0	28.8	4.7	273.6	14.6	257.2	27.4	1.4	4.6	16.0	7.3	23.1	3.0	14.6	99.7	1,779	Arroyo Hondo 4
Arroyo Hondo 5	7	1,454.9	30.8	3.6	310.3	15.6	317.1	21.4	1.1	3.6	12.5	5.8	18.2	2.3	11.4	131.7	2,340	Arroyo Hondo 5
Arroyo Hondo 6	7	477.2	20.7	1.6	285.3	10.5	317.1	6.0	0.3	1.5	3.5	2.4	7.4	1.0	3.2	68.0	1,206	Arroyo Hondo 6
Arroyo Hondo 7	14	557.4	22.7	2.9	257.5	11.5	257.2	13.9	0.7	2.9	8.1	4.6	14.2	1.9	7.4	69.2	1,232	Arroyo Hondo 7
Arroyo Hondo 8	11	90.2	10.6	1.6	196.4	5.4	232.8	4.5	0.2	1.5	2.6	2.4	7.4	1.0	2.4	33.3	592	Arroyo Hondo 8
Bitter Creek 1	16	359.9	20.7	2.5	281.4	10.5	150.8	11.5	0.6	2.4	6.7	3.9	10.9	1.6	6.1	51.7	921	Bitter Creek 1
Bitter Creek 2	17	2,668.1	51.0	2.6	424.7	25.9	217.3	27.7	1.4	2.6	16.2	4.1	11.5	1.7	14.8	207.2	3,677	Bitter Creek 2
Bitter Creek 3	123	509.6	30.8	1.0	343.4	15.6	186.3	6.1	0.3	1.0	3.5	1.6	4.5	0.7	3.2	66.2	1,174	Bitter Creek 3
Bitterwater Valley 1	18	343.7	17.7	6.2	300.8	9.0	465.7	23.8	1.2	6.2	13.9	9.8	31.0	4.0	12.7	73.7	1,319	Bitterwater Valley 1
Bitterwater Valley 2	128	159.7	12.6	3.0	288.6	6.4	467.9	8.7	0.5	3.0	5.1	4.7	14.6	1.9	4.6	58.5	1,040	Bitterwater Valley 2
Bitterwater Valley 3	128	56.8	7.6	1.2	275.6	3.8	467.9	2.4	0.1	1.2	1.4	1.9	5.8	0.8	1.3	49.5	877	Bitterwater Valley 3
Broad Creek	98	37.0	6.8	1.3	164.9	3.5	110.9	1.9	0.1	1.3	1.1	2.0	5.5	0.8	1.0	20.2	358	Broad Creek
Buena Vista Creek	97	105.5	6.8	2.0	164.9	3.5	144.1	3.5	0.2	1.9	2.1	3.1	8.2	1.3	1.9	26.7	476	Buena Vista Creek
Buena Vista Lake Bed	-	0.0	1.0	30.8	17.2	0.5	2.2	5.5	0.3	30.6	3.2	48.6	134.8	19.8	2.9	16.5	314	Buena Vista Lake Bed
Cantua Creek 1	116	6,974.3	32.8	9.9	284.3	16.6	208.5	79.6	4.2	9.8	46.4	15.5	47.1	6.3	42.5	463.7	8,242	Cantua Creek 1
Cantua Creek 2	20	966.0	24.7	6.8	257.0	12.5	195.1	36.8	1.9	6.6	21.5	10.5	31.3	4.3	19.6	94.2	1,689	Cantua Creek 2
Cantua Creek 3	22	331.9	18.7	3.6	228.1	9.5	177.4	14.9	0.8	3.6	8.7	5.7	16.9	2.3	8.0	49.2	879	Cantua Creek 3
Cantua Creek 4	21	151.5	10.6	1.8	159.2	5.4	126.4	4.9	0.3	1.8	2.9	2.9	8.4	1.2	2.6	28.6	509	Cantua Creek 4
Cantua Creek 5	116	3,243.6	22.7	5.7	257.5	11.5	208.5	30.8	1.6	5.7	18.0	9.0	26.8	3.7	16.4	230.5	4,092	Cantua Creek 5
Cantua Creek 6	116	1,012.9	12.6	2.1	229.2	6.4	208.5	7.0	0.4	2.1	4.1	3.3	9.6	1.3	3.7	89.9	1,593	Cantua Creek 6
Cantua Creek 7	20	174.1	14.6	2.6	228.7	7.4	195.1	9.0	0.5	2.5	5.3	4.0	11.7	1.6	4.8	39.3	701	Cantua Creek 7
Capita Canyon	42	171.4	18.7	0.3	256.5	9.5	124.2	1.6	0.1	0.3	0.9	0.4	1.3	0.2	0.9	35.1	621	Capita Canyon
Castac Valley 1	47	2,082.7	25.8	4.7	451.0	13.1	146.4	49.6	2.6	4.7	28.9	7.4	26.6	3.0	26.4	170.6	3,044	Castac Valley 1
Castac Valley 2	117	7,144.7	76.3	5.3	372.8	38.7	51.0	72.4	3.8	5.3	42.2	8.4	29.9	3.4	38.6	471.0	8,364	Castac Valley 2
Castac Valley 3	117	3,987.7	63.6	3.0	344.2	32.3	51.0	38.5	2.0	3.0	22.4	4.7	16.5	1.9	20.5	274.1	4,865	Castac Valley 3
Castac Valley 4	117	1,998.8	51.0	1.7	313.9	25.9	51.0	19.0	1.0	1.7	11.1	2.8	9.7	1.1	10.1	149.3	2,648	Castac Valley 4
Castac Valley 5	117	880.4	38.4	0.9	281.4	19.5	51.0	8.1	0.4	0.9	4.7	1.5	5.2	0.6	4.3	77.5	1,375	Castac Valley 5
Deep Gulch	28	64.9	14.6	1.0	175.8	7.4	93.1	3.5	0.2	1.1	2.0	1.7	4.6	0.7	1.9	22.2	395	Deep Gulch
Del Puerto Canyon 1	191	55.9	13.1	1.6	101.4	6.7	8.9	5.3	0.3	1.5	3.1	2.4	6.8	1.0	2.8	12.4	223	Del Puerto Canyon 1
Del Puerto Canyon 2	193	120.9	17.2	1.7	135.0	8.7	42.1	5.6	0.3	1.6	3.3	2.6	7.3	1.1	3.0	20.8	371	Del Puerto Canyon 2
Del Puerto Canyon 3	194	331.0	22.2	2.9	159.2	11.3	46.6	11.5	0.6	2.8	6.7	4.5	12.6	1.8	6.1	36.7	657	Del Puerto Canyon 3
Del Puerto Canyon 4	193	54.1	12.1	0.8	111.8	6.1	42.1	2.1	0.1	0.7	1.2	1.2	3.3	0.5	1.1	14.1	251	Del Puerto Canyon 4
Del Puerto Canyon 5	194	149.7	16.2	1.3	135.0	8.2	46.6	4.3	0.2	1.3	2.5	2.0	5.7	0.8	2.3	22.4	399	Del Puerto Canyon 5

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Appendix C. Cost Estimates (in \$ Million)

Alternative Offstream Reservoir	Main Dam Number	Embankment Construction Cost	Spillway Cost	Project Lands Cost	Pumping-Generating Facility Cost	Penstock Cost	Conveyance Facilities Cost	Outlet Works Cost	Emergency Release Facilities Cost	General Reservoir Cost	Misc. Cost	Roads Cost	Mitigation Cost	Recreation Cost	Initial Filling Cost	Bond Financing Cost	Total Capital Cost	Alternative Offstream Reservoir
Garzas Creek 1	104	1,402.6	36.9	14.0	236.9	18.7	124.2	105.2	5.5	13.9	61.4	22.1	62.7	9.0	56.1	126.2	2,295	Garzas Creek 1
Garzas Creek 2	105	472.6	26.8	7.3	205.6	13.6	124.2	37.7	2.0	7.2	22.0	11.4	31.7	4.6	20.1	57.7	1,045	Garzas Creek 2
Garzas Creek 3	106	210.2	19.7	4.7	151.2	10.0	64.3	18.7	1.0	4.6	10.9	7.3	20.4	3.0	10.0	31.4	567	Garzas Creek 3
Garzas Creek 4	107	212.0	16.2	3.8	130.1	8.2	42.1	15.7	0.8	3.8	9.2	6.0	16.7	2.5	8.4	27.9	503	Garzas Creek 4
Garzas Creek 5	108	720.7	24.7	7.8	170.4	12.5	64.3	34.4	1.8	7.7	20.1	12.2	33.8	5.0	18.4	66.6	1,200	Garzas Creek 5
Garzas Creek 6	109	977.8	30.8	9.9	205.0	15.6	95.4	56.3	2.9	9.8	32.9	15.6	44.3	6.4	30.0	89.8	1,623	Garzas Creek 6
Garzas Creek 7	108	487.1	20.7	4.6	155.6	10.5	64.3	20.8	1.1	4.5	12.1	7.1	19.7	2.9	11.1	48.5	871	Garzas Creek 7
Garzas Creek 8	108	171.4	14.6	2.5	130.9	7.4	64.3	8.3	0.4	2.4	4.8	3.8	10.3	1.6	4.4	25.3	452	Garzas Creek 8
Garzas Creek 9	109	704.5	26.8	7.2	192.0	13.6	95.4	35.9	1.9	7.1	21.0	11.4	31.5	4.6	19.2	68.9	1,241	Garzas Creek 9
Garzas Creek 10	109	324.7	20.7	3.9	171.1	10.5	95.4	16.6	0.9	3.9	9.7	6.1	17.0	2.5	8.9	40.8	733	Garzas Creek 10
Garzas Creek 11	109	196.6	16.7	2.2	156.3	8.4	95.4	9.8	0.5	2.1	5.7	3.4	9.2	1.4	5.2	30.4	543	Garzas Creek 11
Garzas Creek 12	105	323.8	22.7	5.2	192.7	11.5	124.2	22.8	1.2	5.2	13.3	8.3	23.0	3.4	12.2	45.2	815	Garzas Creek 12
Garzas Creek 13	105	237.2	20.7	4.7	185.7	10.5	124.2	17.3	0.9	4.7	10.1	7.4	20.7	3.0	9.2	38.6	695	Garzas Creek 13
Garzas Creek 14	106	84.8	14.6	2.5	130.9	7.4	64.3	8.3	0.4	2.4	4.9	3.8	10.4	1.6	4.4	20.1	361	Garzas Creek 14
Garzas Creek 15	106	131.7	16.7	3.4	138.9	8.4	64.3	11.6	0.6	3.4	6.8	5.4	15.0	2.2	6.2	24.4	439	Garzas Creek 15
Garzas Creek 16	107	16.2	6.1	0.8	79.1	3.1	42.1	1.4	0.1	0.8	0.8	1.3	3.5	0.5	0.8	9.3	166	Garzas Creek 16
Garzas Creek 17	107	65.8	10.1	1.7	101.4	5.1	42.1	4.5	0.2	1.7	2.6	2.6	7.1	1.1	2.4	14.7	263	Garzas Creek 17
Garzas Creek 18	104	975.1	32.8	11.6	224.8	16.6	124.2	72.1	3.8	11.4	42.1	18.1	51.4	7.4	38.5	95.0	1,725	Garzas Creek 18
Garzas Creek 19	104	606.1	26.8	7.4	205.6	13.6	124.2	37.7	2.0	7.3	22.0	11.6	32.2	4.7	20.1	65.8	1,187	Garzas Creek 19
Garzas Creek 20	104	368.9	22.7	5.2	192.7	11.5	124.2	22.7	1.2	5.2	13.3	8.2	22.9	3.4	12.1	47.9	862	Garzas Creek 20
Garzas Creek 21	104	126.3	16.7	2.6	171.8	8.4	124.2	8.9	0.5	2.6	5.2	4.1	11.2	1.7	4.8	29.0	518	Garzas Creek 21
Garzas Creek 22	104	61.3	12.6	1.3	157.1	6.4	124.2	4.3	0.2	1.3	2.5	2.1	5.7	0.9	2.3	22.7	405	Garzas Creek 22
Garzas Creek 23	104	74.9	13.6	1.7	160.6	6.9	124.2	5.2	0.3	1.6	3.0	2.6	7.1	1.1	2.8	24.1	430	Garzas Creek 23
Garzas Creek 24	106	46.9	11.6	2.1	117.3	5.9	64.3	4.7	0.2	2.1	2.8	3.3	8.9	1.3	2.5	16.2	290	Garzas Creek 24
Garzas Creek 25	108	101.9	11.6	2.1	117.3	5.9	64.3	4.7	0.2	2.0	2.8	3.2	8.7	1.3	2.5	19.5	348	Garzas Creek 25
Hospital Creek 1	35	661.2	26.8	3.6	209.1	13.6	71.0	23.1	1.2	3.6	13.5	5.7	16.3	2.3	12.3	62.9	1,126	Hospital Creek 1
Hospital Creek 2	124	899.3	36.9	4.6	285.3	18.7	168.5	33.1	1.7	4.5	19.3	7.2	20.5	2.9	17.7	90.0	1,610	Hospital Creek 2
Hospital Creek 3	126	2,897.2	44.9	7.3	321.0	22.8	186.3	69.3	3.6	7.1	40.4	11.4	32.2	4.6	37.0	218.6	3,904	Hospital Creek 3
Hospital Creek 4	127	1,501.8	35.9	6.1	240.2	18.2	84.3	49.2	2.6	6.0	28.7	9.6	27.2	3.9	26.2	120.6	2,161	Hospital Creek 4
Hospital Creek 5	36	42.4	8.1	0.5	136.6	4.1	66.5	1.1	0.1	0.5	0.6	0.8	2.1	0.3	0.6	15.8	280	Hospital Creek 5
Hospital Creek 6	36	271.5	18.2	2.2	175.2	9.2	66.5	9.1	0.5	2.2	5.3	3.5	9.8	1.4	4.9	34.4	614	Hospital Creek 6
Ingram Canyon 1	37	748.7	35.9	7.8	240.2	18.2	51.0	58.6	3.1	7.7	34.2	12.2	36.3	5.0	31.3	75.2	1,365	Ingram Canyon 1
Ingram Canyon 2	37	289.5	25.8	4.4	209.1	13.1	51.0	20.0	1.0	4.4	11.7	7.0	20.8	2.9	10.7	39.5	711	Ingram Canyon 2
Ingram Canyon 3	37	64.9	15.7	1.0	175.8	7.9	51.0	4.0	0.2	1.1	2.3	1.7	5.0	0.7	2.1	19.8	353	Ingram Canyon 3
Ingram/Kern Canyon	37	1,956.4	35.9	9.9	240.2	18.2	51.0	72.1	3.8	9.8	42.0	15.6	47.4	6.4	38.4	150.1	2,697	Ingram/Kern Canyon
Kem Canyon	40	1,212.3	29.8	2.2	240.2	15.1	44.4	13.4	0.7	2.1	7.8	3.4	9.2	1.4	7.1	94.8	1,684	Kem Canyon
Kettleman Plain 1	99	44.2	5.6	15.7	91.3	2.8	88.7	17.0	0.9	15.5	9.9	24.7	64.6	10.1	9.1	22.9	423	Kettleman Plain 1
Kettleman Plain 2	99	26.2	4.3	9.5	84.8	2.2	88.7	8.0	0.4	9.4	4.7	15.0	39.2	6.1	4.3	17.5	320	Kettleman Plain 2
Kettleman Plain 3	99	36.1	5.1	13.3	89.1	2.6	88.7	13.2	0.7	13.1	7.7	20.8	54.4	8.5	7.0	20.7	381	Kettleman Plain 3
Kettleman Plain 4	99	20.7	3.8	7.2	81.4	1.9	88.7	5.3	0.3	7.1	3.1	11.3	28.8	4.6	2.8	15.6	283	Kettleman Plain 4

Appendix C. Cost Estimates (in \$ Million)

Alternative Offstream Reservoir	Main Dam Number	Embankment Construction Cost	Spillway Cost	Project Lands Cost	Pumping-Generating Facility Cost	Penstock Cost	Conveyance Facilities Cost	Outlet Works Cost	Emergency Release Facilities Cost	General Reservoir Cost	Misc. Cost	Roads Cost	Mitigation Cost	Recreation Cost	Initial Filling Cost	Bond Financing Cost	Total Capital Cost	Alternative Offstream Reservoir
Laguna Seca Creek 1	70	312.1	18.7	5.7	193.3	9.5	77.6	13.7	0.7	5.7	8.0	9.0	27.5	3.7	7.3	40.9	733	Laguna Seca Creek 1
Laguna Seca Creek 2	131	112.8	16.7	2.1	175.2	8.4	51.0	5.1	0.3	2.1	3.0	3.3	9.8	1.3	2.7	23.4	417	Laguna Seca Creek 2
Laguna Seca Creek 3	73	118.2	15.7	1.0	156.3	7.9	42.1	3.2	0.2	1.0	1.9	1.6	4.8	0.7	1.7	21.2	378	Laguna Seca Creek 3
Laguna Seca Creek 4	72	31.6	10.1	0.7	111.8	5.1	16.9	1.4	0.1	0.6	0.8	1.0	2.9	0.4	0.8	11.0	195	Laguna Seca Creek 4
Little Panoche Creek 1	76	241.7	14.6	5.5	176.5	7.4	126.4	16.7	0.9	5.5	9.8	8.7	26.3	3.5	8.9	38.4	691	Little Panoche Creek 1
Little Panoche Creek 2	146	74.9	10.6	3.0	157.8	5.4	117.5	6.4	0.3	3.0	3.7	4.7	14.0	1.9	3.4	24.1	431	Little Panoche Creek 2
Little Salado/Crow Creek 1	63	103.7	5.6	4.9	85.9	2.8	28.8	7.9	0.4	4.9	4.6	7.9	23.3	3.2	4.2	16.8	305	Little Salado/Crow Creek 1
Little Salado/Crow Creek 2	67	469.9	18.7	3.6	175.2	9.5	84.3	15.0	0.8	3.5	8.8	5.6	16.7	2.3	8.0	48.7	871	Little Salado/Crow Creek 2
Little Salado/Crow Creek 3	63	27.1	3.5	3.0	73.1	1.8	28.8	2.9	0.2	3.0	1.7	4.8	13.8	1.9	1.6	9.8	177	Little Salado/Crow Creek 3
Little Salado/Crow Creek 4	63	13.5	2.5	2.0	66.7	1.3	28.8	1.3	0.1	2.0	0.8	3.1	9.0	1.3	0.7	7.9	141	Little Salado/Crow Creek 4
Lone Tree Creek 1	30	74.0	12.6	1.0	190.8	6.4	93.1	3.2	0.2	1.1	1.9	1.7	4.9	0.7	1.7	23.5	417	Lone Tree Creek 1
Lone Tree Creek 2	139	1,107.7	32.8	3.6	269.2	16.6	130.8	25.9	1.4	3.7	15.1	5.8	17.3	2.4	13.8	97.8	1,744	Lone Tree Creek 2
Lone Tree Creek 3	139	461.8	22.7	1.8	241.3	11.5	130.8	9.3	0.5	1.7	5.4	2.8	8.0	1.1	5.0	53.9	958	Lone Tree Creek 3
Lone Tree Creek 4	33	92.9	12.6	1.0	176.5	6.4	84.3	3.8	0.2	1.1	2.2	1.7	5.0	0.7	2.0	23.3	414	Lone Tree Creek 4
Lone Tree Creek 5	32	46.0	8.6	0.5	136.6	4.4	55.4	1.1	0.1	0.5	0.7	0.8	2.3	0.3	0.6	15.4	273	Lone Tree Creek 5
Los Banos Creek 1	181	263.4	21.8	25.2	175.8	11.0	62.1	120.0	6.3	25.0	70.0	39.7	139.5	16.2	64.0	57.6	1,098	Los Banos Creek 1
Los Banos Creek 2	181	123.6	17.7	19.6	161.4	9.0	62.1	67.0	3.5	19.5	39.1	30.9	108.5	12.6	35.7	39.7	750	Los Banos Creek 2
Los Banos Creek 3	181	44.2	13.7	12.4	145.9	6.9	62.1	28.6	1.5	12.2	16.7	19.4	67.0	7.9	15.3	25.8	480	Los Banos Creek 3
Los Banos Creek 4	181	23.5	11.7	8.5	137.4	5.9	62.1	16.6	0.9	8.4	9.7	13.3	45.1	5.4	8.8	20.6	378	Los Banos Creek 4
Los Banos Creek 5	181	9.0	7.6	2.6	119.9	3.9	62.1	4.0	0.2	2.5	2.3	4.0	13.3	1.6	2.1	13.9	249	Los Banos Creek 5
Los Gatos Creek 1	26	3,110.1	38.9	18.3	310.8	19.7	499.0	150.0	7.8	18.2	87.5	28.8	94.8	11.7	80.0	263.0	4,739	Los Gatos Creek 1
Los Gatos Creek 2	100	2,350.6	28.8	11.2	280.0	14.6	481.2	70.0	3.7	11.0	40.8	17.5	56.4	7.1	37.3	201.9	3,612	Los Gatos Creek 2
Los Gatos Creek 3	102	203.0	16.7	2.6	259.1	8.4	507.8	10.2	0.5	2.6	6.0	4.1	12.8	1.7	5.4	62.0	1,103	Los Gatos Creek 3
Los Gatos Creek 4	103	517.7	18.7	4.2	259.1	9.5	499.0	17.7	0.9	4.1	10.3	6.5	20.6	2.7	9.4	82.1	1,463	Los Gatos Creek 4
Los Gatos Creek 5	27	21.6	6.1	1.0	198.3	3.1	448.0	1.4	0.1	1.0	0.8	1.6	5.0	0.7	0.8	41.3	731	Los Gatos Creek 5
McKittrick Valley	93	63.1	8.1	3.5	200.1	4.1	144.1	5.3	0.3	3.4	3.1	5.4	15.6	2.2	2.8	27.4	489	McKittrick Valley
Moreno Gulch 1	43	1,597.4	30.8	4.9	309.0	15.6	135.3	35.9	1.9	4.8	20.9	7.7	21.1	3.1	19.1	131.1	2,339	Moreno Gulch 1
Moreno Gulch 2	121	476.3	28.8	3.0	283.4	14.6	126.8	15.9	0.8	3.0	9.3	4.7	12.6	1.9	8.5	58.8	1,048	Moreno Gulch 2
Moreno Gulch 3	121	138.0	18.7	1.0	257.0	9.5	126.8	4.1	0.2	1.0	2.4	1.6	4.4	0.7	2.2	33.9	602	Moreno Gulch 3
Moreno Gulch 4	44	135.3	14.6	0.7	227.6	7.4	105.6	2.2	0.1	0.6	1.3	0.9	2.5	0.4	1.2	29.9	530	Moreno Gulch 4
Mustang Creek	50	174.1	15.7	0.8	159.2	7.9	33.3	3.6	0.2	0.8	2.1	1.3	3.8	0.5	1.9	24.2	429	Mustang Creek
Orestimba Creek 1	171	1,203.3	26.3	9.8	173.8	13.3	66.5	68.2	3.6	9.7	39.8	15.3	46.5	6.2	36.4	100.6	1,819	Orestimba Creek 1
Orestimba Creek 2	171	392.4	16.2	4.9	135.0	8.2	66.5	22.7	1.2	5.0	13.2	7.9	23.4	3.2	12.1	41.8	754	Orestimba Creek 2
Orestimba Creek 3	170	626.9	31.3	9.8	208.6	15.9	113.1	54.0	2.8	9.7	31.5	15.4	46.6	6.3	28.8	69.9	1,271	Orestimba Creek 3
Orestimba Creek 4	170	212.9	21.2	2.9	174.5	10.8	113.1	17.7	0.9	2.9	10.3	4.6	13.4	1.9	9.4	35.1	632	Orestimba Creek 4
Orestimba Creek 5	170	32.5	11.1	1.3	135.8	5.6	113.1	4.5	0.2	1.3	2.6	2.1	6.1	0.9	2.4	19.0	339	Orestimba Creek 5
Orestimba Creek 6	171	28.9	6.1	1.4	85.9	3.1	66.5	2.9	0.2	1.4	1.7	2.2	6.3	0.9	1.5	12.4	221	Orestimba Creek 6
Ortigalita Creek	176	77.6	12.1	3.5	179.2	6.1	110.9	6.0	0.3	3.5	3.5	5.5	18.5	2.3	3.2	25.6	458	Ortigalita Creek
Oso Creek 1	138	306.7	18.7	1.7	175.2	9.5	95.8	7.0	0.4	1.7	4.1	2.7	8.2	1.1	3.7	37.9	674	Oso Creek 1
Oso Creek 2	160	203.0	16.7	1.3	175.8	8.4	101.3	5.0	0.3	1.3	2.9	2.1	6.6	0.9	2.7	31.5	560	Oso Creek 2

Appendix C. Cost Estimates (in \$ Million)

Alternative Offstream Reservoir	Main Dam Number	Embankment Construction Cost	Spillway Cost	Project Lands Cost	Pumping-Generating Facility Cost	Penstock Cost	Conveyance Facilities Cost	Outlet Works Cost	Emergency Release Facilities Cost	General Reservoir Cost	Misc. Cost	Roads Cost	Mitigation Cost	Recreation Cost	Initial Filling Cost	Bond Financing Cost	Total Capital Cost	Alternative Offstream Reservoir
Packwood Creek 1	79	252.6	14.6	5.2	230.9	7.4	388.1	16.6	0.9	5.2	9.7	8.2	23.6	3.4	8.9	57.8	1,033	Packwood Creek 1
Packwood Creek 2	130	49.6	8.6	2.6	216.2	4.4	392.5	5.5	0.3	2.5	3.2	4.0	11.2	1.6	2.9	42.0	747	Packwood Creek 2
Panoche Hills	132	122.7	13.6	1.8	211.5	6.9	135.3	5.1	0.3	1.8	3.0	2.9	8.0	1.2	2.7	30.8	548	Panoche Hills
Panoche/Silver Creek 1	45	1,123.0	28.8	9.4	225.3	14.6	192.9	59.3	3.1	9.3	34.6	14.7	39.4	6.0	31.6	105.3	1,897	Panoche/Silver Creek 1
Panoche/Silver Creek 2	111	142.5	10.6	4.6	157.8	5.4	73.8	14.5	0.8	4.5	8.5	7.1	20.8	2.9	7.7	27.1	489	Panoche/Silver Creek 2
Panoche/Silver Creek 3	112	757.7	22.7	10.8	192.7	11.5	71.9	64.1	3.3	10.7	37.4	17.0	51.0	6.9	34.2	75.0	1,367	Panoche/Silver Creek 3
Panoche/Silver Creek 4	113	847.9	26.8	11.6	225.3	13.6	114.0	40.3	2.1	11.5	23.5	18.3	49.0	7.5	21.5	83.0	1,496	Panoche/Silver Creek 4
Panoche/Silver Creek 5	114	1,947.4	30.8	25.9	224.8	15.6	76.1	158.8	8.3	25.6	92.6	40.7	127.4	16.6	84.7	166.4	3,042	Panoche/Silver Creek 5
Panoche/Silver Creek 6	111	50.5	6.6	2.7	142.1	3.3	73.2	5.5	0.3	2.7	3.2	4.3	12.3	1.7	2.9	18.4	330	Panoche/Silver Creek 6
Panoche/Silver Creek 7	111	89.3	8.6	3.6	149.7	4.4	73.2	9.5	0.5	3.6	5.5	5.8	16.9	2.3	5.1	22.2	400	Panoche/Silver Creek 7
Panoche/Silver Creek 8	112	192.1	12.6	4.8	157.1	6.4	71.0	15.9	0.8	4.8	9.3	7.6	22.3	3.1	8.5	30.3	547	Panoche/Silver Creek 8
Panoche/Silver Creek 9	112	369.8	16.7	7.4	172.5	8.4	71.0	30.8	1.6	7.3	18.0	11.6	34.1	4.7	16.4	45.0	815	Panoche/Silver Creek 9
Panoche/Silver Creek 10	45	680.1	24.7	6.9	212.7	12.5	192.9	40.0	2.1	6.9	23.3	10.9	28.5	4.4	21.3	74.5	1,342	Panoche/Silver Creek 10
Panoche/Silver Creek 11	45	309.4	18.7	4.3	193.9	9.5	192.9	19.7	1.0	4.3	11.5	6.8	17.7	2.8	10.5	47.4	850	Panoche/Silver Creek 11
Panoche/Silver Creek 12	45	47.8	8.6	1.3	157.8	4.4	192.9	2.8	0.1	1.2	1.6	2.0	5.0	0.8	1.5	25.5	453	Panoche/Silver Creek 12
Panoche/Silver Creek 13	113	578.2	22.7	5.7	213.3	11.5	113.1	22.5	1.2	5.6	13.1	8.9	23.3	3.6	12.0	61.1	1,096	Panoche/Silver Creek 13
Panoche/Silver Creek 14	113	234.5	16.7	2.1	193.9	8.4	113.1	9.5	0.5	2.1	5.5	3.3	8.5	1.4	5.1	35.9	641	Panoche/Silver Creek 14
Panoche/Silver Creek 15	114	1,397.2	26.8	17.2	212.7	13.6	75.4	109.5	5.7	17.0	63.9	27.0	82.9	11.0	58.4	122.9	2,241	Panoche/Silver Creek 15
Panoche/Silver Creek 16	114	773.9	20.7	10.4	193.3	10.5	75.4	60.4	3.1	10.2	35.2	16.3	48.8	6.6	32.2	75.5	1,373	Panoche/Silver Creek 16
Panoche/Silver Creek 17	114	155.1	10.6	4.4	157.8	5.4	75.4	14.6	0.8	4.4	8.5	6.9	20.4	2.8	7.8	27.9	503	Panoche/Silver Creek 17
Panoche/Silver Creek 18	114	54.1	6.6	2.7	142.1	3.3	75.4	5.5	0.3	2.6	3.2	4.2	12.1	1.7	2.9	18.7	335	Panoche/Silver Creek 18
Panoche/Silver Creek 19	112	73.1	7.6	2.7	137.4	3.8	71.0	4.6	0.2	2.7	2.7	4.2	12.1	1.7	2.5	19.3	346	Panoche/Silver Creek 19
Pleito Creek 1	86	7,365.7	68.2	3.4	425.4	34.6	143.7	47.0	2.5	3.4	27.4	5.3	16.2	2.2	25.1	488.6	8,659	Pleito Creek 1
Pleito Creek 2	118	8,122.5	81.3	9.2	497.0	41.2	164.8	146.8	7.7	9.2	85.6	14.6	46.0	5.9	78.3	553.6	9,864	Pleito Creek 2
Pleito Creek 3	118	5,421.0	68.7	6.4	473.9	34.8	164.8	81.4	4.2	6.3	47.5	10.1	31.2	4.1	43.4	381.0	6,779	Pleito Creek 3
Pleito Creek 4	118	2,989.2	56.1	3.8	450.3	28.4	164.8	39.7	2.1	3.7	23.2	5.9	18.4	2.4	21.2	227.1	4,036	Pleito Creek 4
Pleito Creek 5	118	1,352.1	43.4	1.8	425.4	22.0	164.8	17.0	0.9	1.8	9.9	2.9	8.9	1.2	9.1	123.1	2,184	Pleito Creek 5
Pleito Creek 6	118	509.6	30.8	0.9	399.5	15.6	164.8	6.2	0.3	0.9	3.6	1.4	4.1	0.6	3.3	68.3	1,210	Pleito Creek 6
Quinto Creek 1	54	309.4	14.4	5.6	138.2	7.3	42.1	19.9	1.0	5.5	11.6	8.7	26.0	3.6	10.6	35.4	639	Quinto Creek 1
Quinto Creek 2	101	427.5	20.7	4.3	177.2	10.5	84.5	22.9	1.2	4.3	13.3	6.8	20.1	2.8	12.2	47.6	856	Quinto Creek 2
Quinto Creek 3	54	120.0	9.3	3.0	116.4	4.7	42.1	6.8	0.4	3.0	4.0	4.7	13.6	1.9	3.6	19.7	353	Quinto Creek 3
Romero Creek 1	56	193.0	14.4	2.7	138.2	7.3	44.4	11.0	0.6	2.7	6.4	4.3	12.0	1.7	5.9	26.2	471	Romero Creek 1
Romero Creek 2	56	85.7	10.4	1.8	120.8	5.2	44.4	5.3	0.3	1.8	3.1	2.8	8.0	1.2	2.8	17.4	311	Romero Creek 2
Salado Creek 1	62	193.9	18.7	1.3	193.3	9.5	77.6	4.7	0.2	1.3	2.7	2.1	5.9	0.9	2.5	30.7	545	Salado Creek 1
Salado Creek 2	135	265.2	20.7	2.1	192.7	10.5	64.3	8.8	0.5	2.0	5.1	3.2	9.0	1.3	4.7	35.0	625	Salado Creek 2
Salado Creek 3	137	364.4	25.8	5.3	240.7	13.1	106.4	22.9	1.2	5.2	13.4	8.3	23.9	3.4	12.2	49.8	896	Salado Creek 3
Salado Creek 4	137	83.9	15.7	1.4	210.9	7.9	106.4	3.5	0.2	1.4	2.0	2.2	6.3	0.9	1.9	26.5	471	Salado Creek 4
Salt Creek 1-Fresno Co.	24	633.2	26.8	4.3	257.0	13.6	177.4	22.8	1.2	4.3	13.3	6.8	20.2	2.8	12.2	70.9	1,267	Salt Creek 1-Fresno Co.
Salt Creek 2-Fresno Co.	24	507.8	24.7	3.6	251.3	12.5	177.4	19.7	1.0	3.6	11.5	5.7	16.9	2.3	10.5	62.1	1,111	Salt Creek 2-Fresno Co.
Salt Creek 3-Fresno Co.	24	194.8	16.7	1.7	228.1	8.4	177.4	7.0	0.4	1.7	4.1	2.6	7.7	1.1	3.7	39.0	694	Salt Creek 3-Fresno Co.

Appendix C. Cost Estimates (in \$ Million)

Alternative Offstream Reservoir	Main Dam Number	Embankment Construction Cost	Spillway Cost	Project Lands Cost	Pumping-Generating Facility Cost	Penstock Cost	Conveyance Facilities Cost	Outlet Works Cost	Emergency Release Facilities Cost	General Reservoir Cost	Misc. Cost	Roads Cost	Mitigation Cost	Recreation Cost	Initial Filling Cost	Bond Financing Cost	Total Capital Cost	Alternative Offstream Reservoir
Salt Creek 1-Kern Co.	91	1,219.5	38.4	2.1	399.5	19.5	126.6	17.0	0.9	2.1	9.9	3.3	8.8	1.3	9.1	110.9	1,969	Salt Creek 1-Kern Co.
Salt Creek 2-Kern Co.	134	1,060.8	40.9	2.2	313.5	20.7	71.9	19.4	1.0	2.2	11.3	3.5	9.5	1.4	10.3	93.4	1,662	Salt Creek 2-Kern Co.
Salt Creek 3-Kern Co.	134	296.8	28.3	1.0	281.4	14.3	71.9	6.3	0.3	1.0	3.7	1.7	4.4	0.7	3.4	42.7	758	Salt Creek 3-Kern Co.
Salt Creek 1-Merced Co.	1	8.1	5.6	2.7	117.3	2.8	55.4	3.7	0.2	2.7	2.1	4.3	13.2	1.7	2.0	13.1	235	Salt Creek 1-Merced Co.
Salt Creek 2-Merced Co.	148	25.3	5.6	3.4	122.5	2.8	64.3	4.3	0.2	3.3	2.5	5.3	16.3	2.1	2.3	15.3	276	Salt Creek 2-Merced Co.
San Emigdio Creek 1	77	571.0	20.7	1.6	373.2	10.5	181.8	6.1	0.3	1.5	3.5	2.4	6.8	1.0	3.2	70.8	1,254	San Emigdio Creek 1
San Emigdio Creek 2	120	3,054.2	63.6	3.3	540.9	32.3	71.9	45.4	2.4	3.2	26.5	5.2	14.5	2.1	24.2	231.8	4,122	San Emigdio Creek 2
San Luis Creek 1	143	1,536.1	36.9	8.5	238.6	18.7	102.0	71.8	3.7	8.3	41.9	13.2	39.3	5.4	38.3	127.1	2,290	San Luis Creek 1
San Luis Creek 2	143	1,188.8	32.8	7.0	226.5	16.6	102.0	51.7	2.7	6.9	30.2	11.0	32.6	4.5	27.6	102.5	1,843	San Luis Creek 2
San Luis Creek 3	143	656.7	26.8	4.7	207.4	13.6	102.0	30.1	1.6	4.7	17.5	7.4	22.1	3.0	16.0	65.7	1,179	San Luis Creek 3
San Luis Creek 4	143	98.3	12.6	1.3	159.2	6.4	102.0	4.2	0.2	1.3	2.5	2.1	6.1	0.9	2.2	23.8	423	San Luis Creek 4
San Luis Creek 5	145	329.2	16.7	3.6	157.8	8.4	101.3	16.9	0.9	3.6	9.9	5.7	16.9	2.3	9.0	40.3	723	San Luis Creek 5
San Luis Creek 6	145	93.8	10.6	2.1	134.2	5.4	101.3	6.4	0.3	2.0	3.7	3.2	9.4	1.3	3.4	22.3	399	San Luis Creek 6
Sandy Creek	92	128.1	9.3	1.7	108.1	4.7	35.5	3.0	0.2	1.7	1.8	2.7	7.8	1.1	1.6	18.3	326	Sandy Creek
Santiago Creek 1	19	2,275.7	33.3	3.1	424.7	16.9	221.8	27.5	1.4	3.1	16.1	4.9	14.2	2.0	14.7	182.6	3,242	Santiago Creek 1
Santiago Creek 2	19	763.1	20.7	1.7	399.9	10.5	221.8	8.8	0.5	1.6	5.1	2.6	7.5	1.1	4.7	86.6	1,536	Santiago Creek 2
Sunflower Valley 1	177	83.9	6.3	18.5	142.1	3.2	221.8	32.1	1.7	18.3	18.7	29.1	90.1	11.9	17.1	39.9	735	Sunflower Valley 1
Sunflower Valley 2	177	52.3	5.1	14.0	136.6	2.6	221.8	19.3	1.0	13.9	11.3	22.1	67.1	9.0	10.3	34.0	620	Sunflower Valley 2
Sunflower Valley 3	177	29.8	3.8	9.6	130.9	1.9	221.8	10.1	0.5	9.5	5.9	15.2	46.0	6.2	5.4	29.1	526	Sunflower Valley 3
Sunflower Valley 4	177	13.5	2.5	5.6	125.1	1.3	221.8	4.0	0.2	5.5	2.3	8.8	26.1	3.6	2.1	25.0	447	Sunflower Valley 4
Wildcat Canyon	74	140.7	14.6	2.1	193.9	7.4	102.0	4.7	0.2	2.0	2.8	3.2	8.6	1.3	2.5	28.9	515	Wildcat Canyon

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